CENTERS FOR DISEASE CONTROL AND PREVENTION

Global Work Group (GWG) of the CDC Advisory Committee to the Director (ACD)

Minutes from the October 19, 2016 Meeting

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Global Work Group (GWG): Record of the October 19, 2016 Meeting

The Global Work Group (GWG) of the Centers for Disease Control and Prevention (CDC) Advisory Committee to the Director (ACD) convened On October 19, 2016 at the Arlen Specter Headquarters and Emergency Operations Center on CDC's Clifton Road Campus from 9:00 a.m. until 3:30 p.m. EDT. The meeting included highlights of the April 2016 GWG meeting; updates from CDC's Center for Global Health (CGH); updates on the global Zika response activities; National Center for Birth Defects and Developmental Disabilities (NCBDDD) Zika activities in Latin America; an update on polio and polio transition; and a presentation on Global Hearts.

Welcome and Introductions

Dr. Tom Farley (GWG Chair; Chief Executive Officer, Public Good Projects) called the meeting to order at 9:00 a.m. The GWG members and other meeting attendees present in the room and via teleconference introduced themselves. None of the GWG members present had any conflicts of interest (COIs) to disclose. A list of meeting participants is appended to this summary as Attachment A.

Highlights of April 2016 GWG Meeting

Dr. Tom Farley (GWG Chair; Chief Executive Officer, Public Good Projects) summarized what occurred during the April 2016 GWG Meeting to refresh everyone's memories and inform those who were new of what the GWG discussed in April. He reported that Dr. Rebecca Martin provided an overview of activities at the Center for Global Health (CGH), including the Global Health Security Agenda (GHSA), the Child Health and Mortality Prevention Surveillance Network (CHAMPS), malaria and filariasis, polio eradication, the National Action Plan for Multidrug-Resistant Tuberculosis (MDR-TB), and Yellow Fever (YF). In addition, there were in-depth discussions pertaining to the GHSA country assessments, malaria research, and Zika.

A number of cross-cutting issues were raised by the GWG during that meeting, which Dr. Farley took forward to the Advisory Committee to the Director (ACD). There was a discussion regarding the balance between the need for crisis response capacity, and needing general public health infrastructure because it is not possible to know when or where another crisis will occur. Therefore, it is important for CDC to try to maintain support for both of these. The GWG also recognized that there are limited public health prevention tools for some key infectious diseases such as malaria, tuberculosis (TB), and Zika. Therefore, it is important to continuously have strong research-based programs to respond to these and other health problems, as well as program-informed research to improve prevention tools while simultaneously utilizing existing tools.

There also was recognition that there is an increasing interplay between non-communicable diseases, which are becoming more common in developing countries and infectious disease problems (e.g., the relationship between diabetes and TB, the relationship between influenza and other chronic diseases, et cetera). There was a call to try to use the recent global crises such as Zika to encourage people to respond not only to the crises, but also to the need for comprehensive infrastructure and comprehensive resources for response capabilities. Given the approaching transition, it will be important to persuade the new administration that it is critical to build infrastructure in advance versus waiting for the next crisis.

The GWG also raised some specific topics that Dr. Farley took forward to the ACD regarding GHSA. It was clear that the country assessments either had been or will be bringing to light deficiencies in the capacities of various

countries. That might create local fears for repercussions due to those deficiencies. Nevertheless, the GWG agreed that it is important to have objective measurement. The quantitative and concrete nature of the assessments is important for advocacy, and can be used to garner resources. It is clear that there is some tension between local sensitivities and the need for identifying and addressing problems. Concerns also were expressed with regard to the governance of this system for these countries, and the importance of getting that right in order for it to be as valuable as possible.

Pertaining to Zika, the GWG recognized that prevention will not be entirely successful in the short-term, and emphasized the importance of communicating these facts so that people understand this clearly. There also was a call to study locations where Zika is endemic and areas that have experienced previous epidemics to better understand the likely future of the virus in the United States (US) and other countries throughout the world.

Center for Global Health Updates

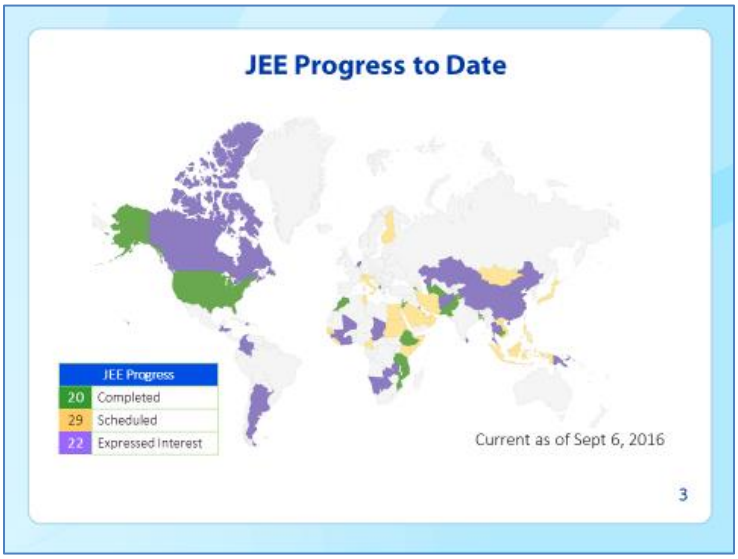
Vikas (Vik) Kapil, DO, MPH (Acting Designated Federal Official, Associate Director for Science / Chief Medical Officer, Center for Global Health) presented updates on various initiatives from CGH. He said he was very pleased that all of the CDC divisions would be represented in the meeting, either already present or joining them later in the day, in the event that members had any questions or wished to discuss any of the issues more in-depth.

Emphasizing that 2016 has been a busy year for the CGH, Dr. Kapil reported that CGH awarded $3.2 billion in contracts and cooperative agreements to support a range of global health activities during fiscal year (FY) 2016. That represents the vast majority of the CGH's overall budget, which for FY2016 was about $3.7 billion. There are a number of new and acting leadership in key roles, which are as follows:

- Nick DeLuca is the new Associate Director for Communications (ADC)
- Hamid Jafari is Acting Division Director for the Division of Global Health Protection (DGHP)
- John Nkengasong is Acting Principal Deputy Director
- Monica Parise is the new DPDM Director
- Suzanne Theroux is now Acting Deputy Director for Management and Overseas Operations in place of Jenny Parker, who has left CGH for another position within CDC in the Office of the Chief of Staff (OCS), though she will continue to work closely with the CGH in her new role
- Serena Vinter is the new Associate Director for Policy (ADP)
- The Global Immunization Division (GID) Director has been selected, but has not yet been named
- Division of Parasitic Diseases and Malaria (DPDM's) Deputy Director and DGHP Director positions will be advertised as Dr. Jordan Tappero has moved to a new role as Senior Advisor in the CGH OD.

CGH works very actively with a number of key stakeholders to improve messaging and communications regarding all of the CGH successes. Very importantly, the CGH had some recent engagement with the World Bank. Dr. Martin and a number of staff had a high profile meeting with Tim Evans and others at the World Bank on a range of issues related to surveillance in West Africa, Zika, and building countries' capacities for response. With all of this as a backdrop, the CGH also has been actively involved in responding to outbreaks in YF, cholera, and Zika. Zika, of course, has occupied a significant amount of the CGH's time. A number the CGH's staff are heavily engaged in that effort.

Good progress is being made on the GHSA Joint External Evaluation (JEE). As show in the following map, JEEs have been completed in 20 countries, with an additional 29 countries scheduled and another 22 countries that have expressed strong interest:



The countries first conduct a self-assessment, and that is validated by an independent, external team of experts with membership from many countries and organizations. Overall, this effort is going quite well and is very important because most countries have not been prepared adequately to address threats. These country assessments will help drive the country action plans, and most importantly can help inform country investments by governments and partners to help build country-capacity. The following table shows a summary of the initial JEEs weighted average scores by country as of October 3, 2016:

Country	Overall	Prevent	Detect	Respond
JEE				
Bangladesh	50%	58%	70%	33%
Ethiopia	52%	56%	59%	45%
Mozambique	47%	46%	51%	46%
Pakistan	50%	46%	51%	53%
Tanzania	50%	51%	54%	48%
United States	87%	87%	91%	85%
Previous version of GHSA assessment				
Georgia	65%	72%	68%	51%
Peru	67%	59%	76%	67%
Portugal	88%	88%	79%	100%
Uganda	55%	44%	77%	42%
Ukraine	55%	58%	54%	51%
United Kingdom	96%	97%	98%	92%

There is no big surprise in this table in that high-income countries like the US, the United Kingdom (UK), and Portugal tend to have higher scores and lower- and middle-income countries tend to perform on these JEEs with somewhat lower scores. Nevertheless, it is very important that they are able to engage in these types of self-assessments and then have that validated by an external team to help inform their work and allocation of resources.

There are numerous GHSA achievements in all of the core areas on which CDC is focused (disease surveillance, laboratory systems, workforce capacity, emergency operations, rapid response), with some of the key successes shown here:

Disease Surveillance
- 8 Phase I countries have at least 80% of subnational units reporting data to national systems
- 11 Phase I countries have enhanced surveillance systems for zoonotic diseases

Laboratory Systems
- 6 countries detected dangerous pathogens using new equipment and capabilities
- 2,000 lab samples tested for yellow fever in DRC to help target ring vaccination campaign

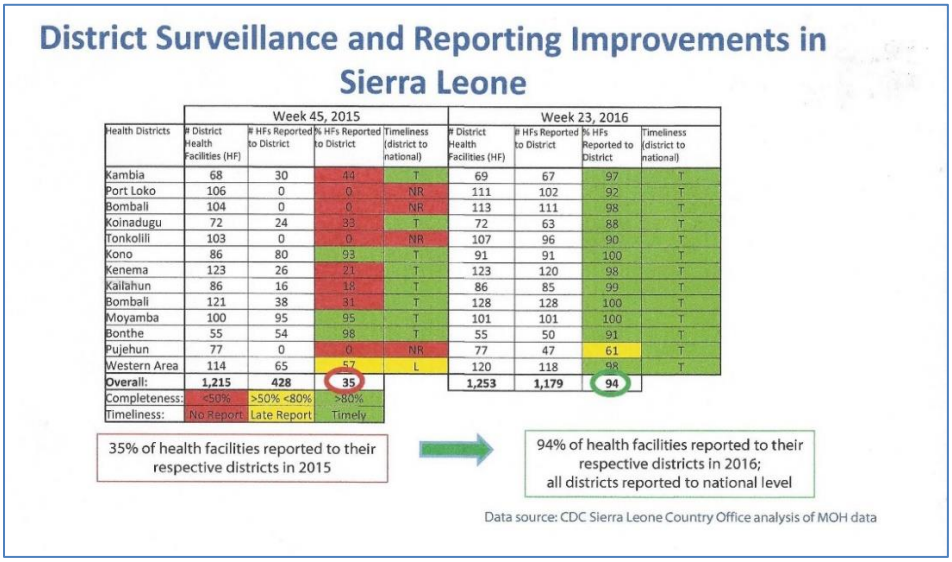
Workforce Capacity
- All 25 Phase I and HRNA countries now have an operational Field Epidemiology Training Programs
- 1,430 individuals (frontline, intermediate, and advanced) trained or currently being trained in field epidemiology in GHSA phase I and II countries

Emergency Operations
- 972 people in 22 countries trained on basic concepts of public health emergency management
- 16 Phase I countries supported in development of Emergency Operations Centers

Rapid Response
- 120 deployments (3,000 person days) by the Global Rapid Response Team in first year of operations
- 288 outbreaks in 152 countries tracked by the Global Disease Detection Operations Center

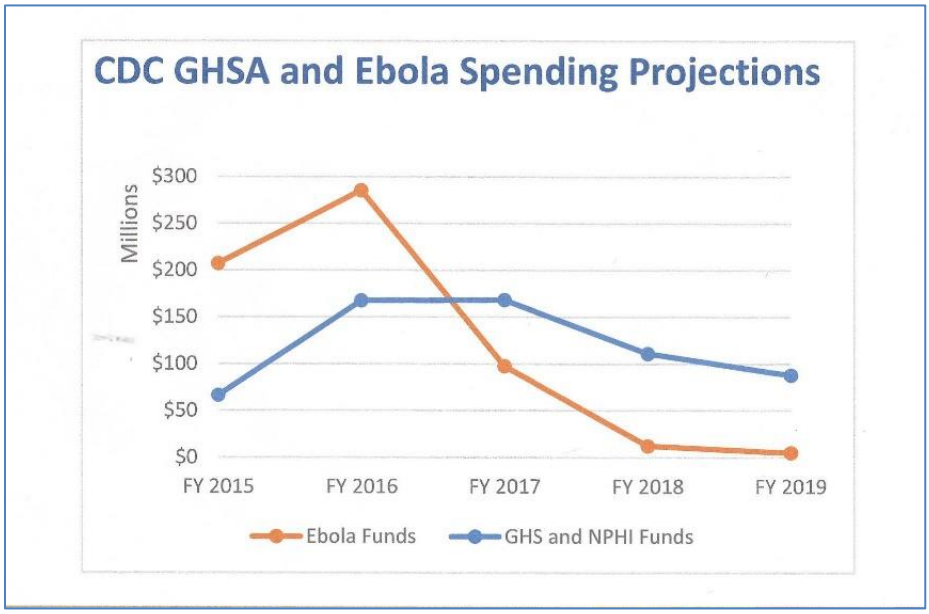
Rapid response was one of the deficiencies identified, particularly with regard to the focus on Ebola in West Africa. Strikingly, CDC's Global Rapid Response Team (GRRT or Global RRT) has now been engaged in 120 deployments throughout the world. GRRT's surge capacity to respond is illustrated by its activities from September 2015 through July 2016 depicted in the following map:

Improvement in surveillance systems is very important for countries to inform their public health policies and decision-making related not only to outbreaks, but also other general public health needs. Significant improvements have been made in the ability of some of the districts to report. The following table is a very good example from Sierra Leone where in November of 2015, only 35% of facilities were reporting to their districts on time. By June of 2016, the number of facilities reporting to their districts on time was at 94%. At the time of this meeting, 97% of facilities were reporting to their districts on time:



Health Districts	Week 45, 2015 # District Health Facilities (HF)	# HFs Reported to District	% HFs Reported to District	Timeliness (district to national)	Week 23, 2016 # District Health Facilities (HF)	# HFs Reported to District	% HFs Reported to District	Timeliness (district to national)
Kambia	68	30	44	T	69	67	97	T
Port Loko	106	0	0	NR	111	102	92	T
Bombali	104	0	0	NR	113	111	98	T
Koinadugu	72	24	33	T	72	63	88	T
Tonkolili	103	0	0	NR	107	96	90	T
Kono	86	80	93	T	91	91	100	T
Kenema	123	26	21	T	123	120	98	T
Kailahun	86	16	18	T	86	85	99	T
Bombali	121	38	31	T	128	128	100	T
Moyamba	100	95	95	T	101	101	100	T
Bonthe	55	54	98	T	55	50	91	T
Pujehun	77	0	0	NR	77	47	61	T
Western Area	114	65	57	L	120	118	98	T
Overall:	**1,215**	**428**	**35**		**1,253**	**1,179**	**94**	
Completeness:	<50%	>50% <80%	>80%					
Timeliness:	No Report	Late Report	Timely					

There are some challenges, which this graph depicts explicitly in terms of CDC's Ebola and GHSA and National Public Health Institute (NPHI) spending projections through FY 2019. These funds are time-limited, which poses a challenge for the CGH and CDC in terms of how to carry on these activities in the future. Of course, they are thinking about this issue. With the USG transition forthcoming, Dr. Kapil emphasized that everyone collectively needs to be aware of this issue:

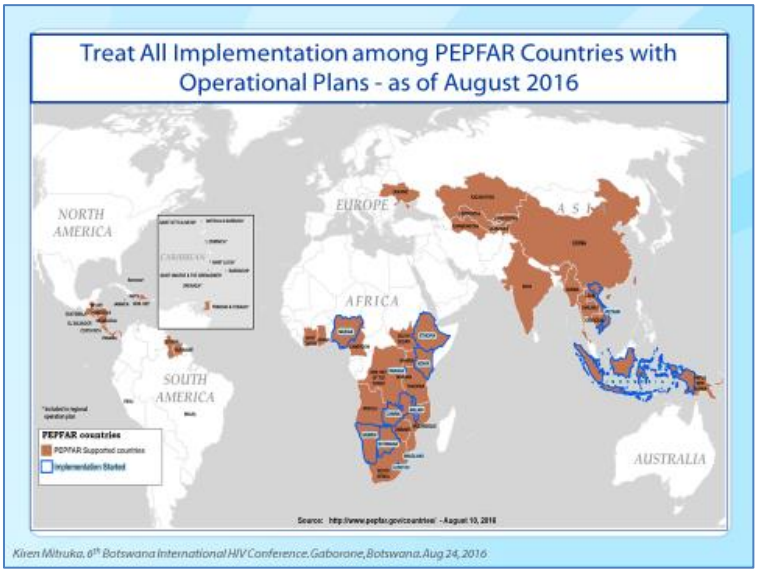


Dr. Kapil emphasized that there is a lot of great work underway in parasitic diseases and malaria, such as the Nigeria Malaria Frontline Project. The goals of this project is to strengthen Nigeria's public health capacity to reduce malaria and to prevent, detect, and respond to disease epidemics. It is being implemented in Zamfara and Kano States with 69.9% and 60.2% parasite prevalence among children under 5 years of age, respectively. This is made possible by direct US government and international donor resources using quality surveillance data to accelerate malaria control in Nigeria. The approach is to build capacity at national, state, and LGA levels. The National Stop Transmission of Polio Program (N-STOP) model of "modular" training and supervision, which involves classroom training and a field practicum, is being utilized to improve collection, analysis, and use of malaria data for decision-making. As that type of capacity is developed, the same type of capacity also is very useful for other health threats as per GHSA goals using polio experience. For example, the polio teams and the President's Emergency Plan for AIDS Relief (PEPFAR) activities in Nigeria were able to pivot to address the Ebola outbreak and response in Nigeria. These activities also will complement existing malaria control efforts that are and have been implemented by the Nigeria Ministry of Health (MoH), by the US government's President's Malaria Initiative (PMI) activities, and by many other partners that work on malaria in Nigeria and Africa. There has been good progress to date in that 34 LGA N-STOP malaria officers have been hired, 2 national and 2 state level supervisors have been hired, baseline data collection has been completed, 3 out of 9 training modules have been developed, training of LGA MoH malaria staff and N-STOP malaria officers from Zamfara and Kano has been completed, and the next TOT training on modules 3 and 4 has been scheduled for November 2016.

With regard to global immunization, three cases of wild poliovirus Type 1 (WPV1) were detected in Borno State, northeast Nigeria. This is an extremely challenging environment in terms of access and security. The occurrence and detection of these cases in some ways is disappointing, but also does illustrate that surveillance systems are working and the importance of maintaining that type of capacity in Nigeria and elsewhere throughout the world. A rapid and aggressive regional vaccination response was conducted with many partners, with four campaigns to reach 1.4 million children. The need to strengthen surveillance in Nigeria and beyond was identified. This was declared a World Health Organization (WHO) Grade 3 Emergency Humanitarian Crisis in Nigeria by the WHO Director General.

A lot of progress has been made over the last couple of decades in terms of measles and rubella control. Measles mortality is significantly decreased throughout the world. However, rubella syndrome and measles-related mortality remain significant concerns and much work remains to be done. There also is a changing environment. A mid-term review was completed recently, making it clear that more progress needs to be made both in terms of strengthening national programs for measles and rubella control and very important to emphasize good surveillance and outbreak investigations. This highlights once again the importance of having good ability to detect cases, investigate outbreaks when they occur, and respond rapidly to those situations with appropriate interventions, immunization programs, et cetera. The new Global Alliance for Vaccines and Immunization (GAVI) measles strategy is another environmental issue on the horizon. GAVI is providing multi-year funding for supplemental immunization activities, including measles and rubella. This represents a significant financial commitment over the next 5 years of greater than $800 million US dollars. As a background, there also are polio transition activities to think about. While there are some risks, there also are opportunities in terms of thinking about how the existing polio infrastructure and staffs in countries could be utilized.

The CGH's Division of Global HIV and TB (DGHT) has an effort underway, entitled "Treat All" implementation activities in PEPFAR countries, with a basic focus of providing treatment based on a person's HIV+ status and not on other criteria, such as CD4 counts. This is significant because when people who are HIV+ are treated aggressively, that also impacts transmission and incidence of HIV. Therefore, this is a very important initiative that is going well. The following map shows the PEPFAR countries with Operational Plans as of August 2016. Implementation has already begun in the countries outlined, with some results already being realized in some of these countries in terms of decreasing incidence in high-risk populations:

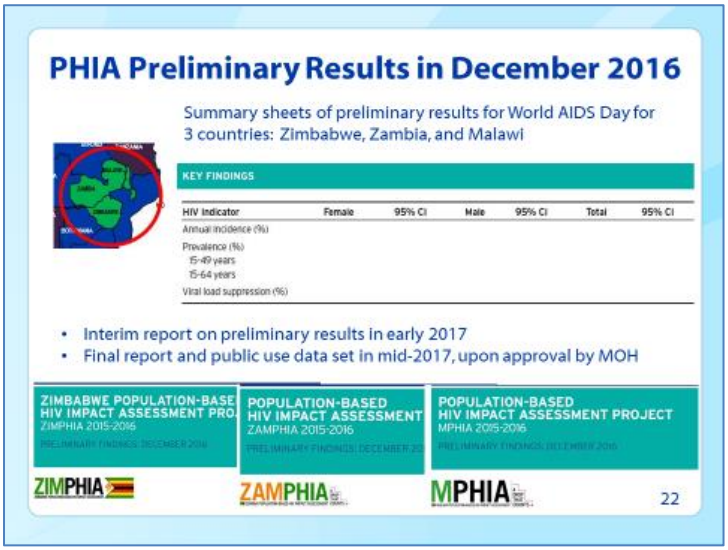


Looking more closely at HIV testing services in Swaziland, in the past testing has been focused generally on just testing people. Part of the shift also is to evaluate positive rates. The following table shows community-based testing by PSI in Swaziland:

	FY15 Results	FY16 Results	FY16 Targets	% of Target Achieved at end of 3rd Quarter
HTC_TST	91,650	26,547	97,382	27%
HTC_TST_POS	3,336	4,913	9,784	50%
Yield (%)	4%	19%	10%	-

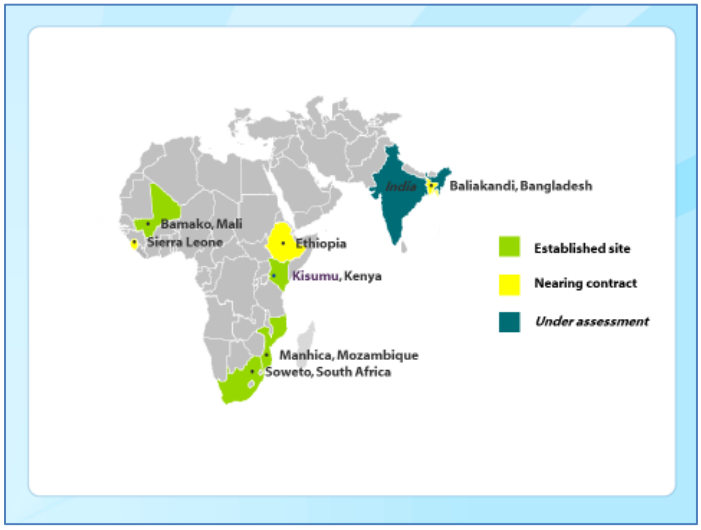
Over time, the PSI work in Swaziland has been able to demonstrate an increased yield or rate of positives. Looking at FY15 results versus FY16 results, the yield is significantly higher and the targets over time, even in a larger population, show consistently higher yields of HIV positive results. Again, the focus is on trying to find those people who are most likely to be infected and also where there is likely to be a significant impact of intervention. The overall result is that fewer tests were conducted, more positives were identified, and the yield was increased to 21%. Intensified weekly monitoring helped identify hotspots and populations to target with mobile testing. Persons living with HIV were identified from clinic registers, and their sexual partners and families were tested. The focus was on the number of positives and not the number of total tests administered.

Turning to the population-based HIV impact assessments (PHIAs), information is collected through routine HIV program monitoring and specialized HIV surveillance. However, data are lacking on the population-based indicators and outcomes of HIV programs. PHIAs can provide inputs for modeling approaches to infer and forecast program needs and trends. To that end, the goals of the PHIAs are to: 1) Define the epidemic by designing and conducting PHIAs that define the status of the HIV epidemic and progress of programs in PEPFAR long-term strategy countries at a given point in time; and 2) Build capacity by strengthening the workforce and infrastructure in targeted countries to have the ability to design, conduct, analyze and disseminate results of PHIAs. PHIAs will measure the reach and impact of HIV programs in PEPFAR countries and guide policy and future prioritization. How the results will look are depicted in these summary sheets for three countries (Zimbabwe, Zambia, and Malawi):



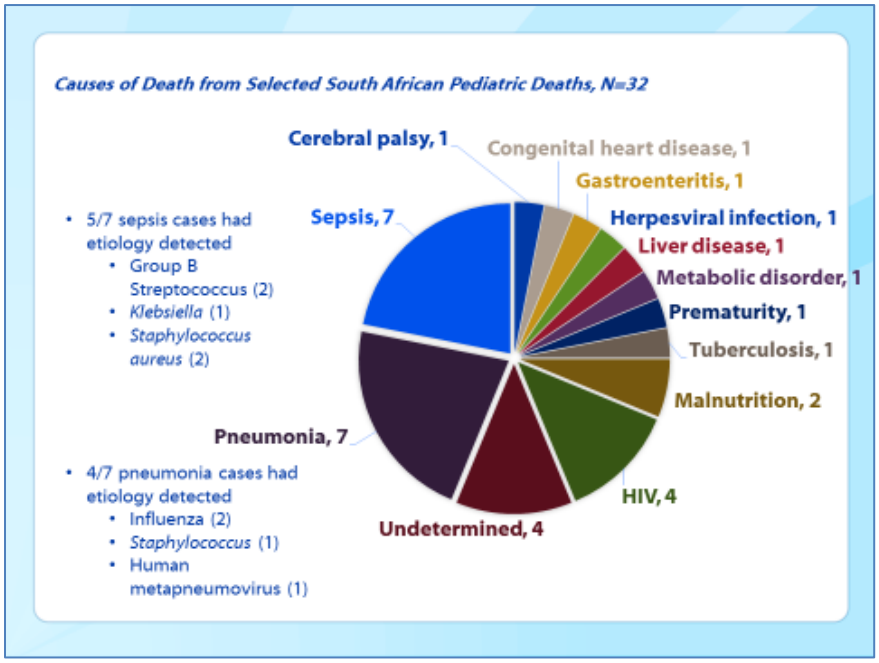
These population-based assessments will show some level of granularity in the categories of Annual Incidence (among males and females), Prevalence (by age), and Viral Load Suppression. Viral load suppression is a critical aspect of preventing transmission.

There is good progress to report with regard to CHAMPS. Four CHAMPS surveillance sites have been established in the following areas, three of which have been launched and are underway as shown on this map:



Emory's original proposal was to establish 6 surveillance sites. It appears that CDC's financial and in-kind staff contributions will enable the addition of Sierra Leone as a seventh CHAMPS site very soon. This is very important work, one aspect of which is the community-engagement component. There are many sensitivities related to minimally-invasive tissue sampling (MITS) after the death of a child. The team in Mali has convened Community Engagement Workshops in Bamako to better understand these sensitivities. Interestingly, 80% of the members of the community agreed that MITS was acceptable with parental permission. Dr. Kapil was impressed with that because that is a pretty good response. However, 82% of participants agreed they would not allow their child to undergo MITS if the procedure interfered with religious practices. In addition, 98% said that pregnancy surveillance was acceptable and 68% attended a traditional healer at least once in past year. A take-home message of this is that when a child dies, it is imperative to be very sensitive and careful in dealing with parents, families, and communities, and think about issues that are important in that community (time for prayer or other religious practices, the offer of compassion and empathy to the family, understanding burial rituals). All of these communities have different cultural challenges, perspectives, et cetera.

The following graphic offers an example of the type of data CHAMPS will produce. These are very selective causes of death from 32 cases of pediatric deaths in South Africa:



Just looking at the sepsis and pneumonia, 5 out of 7 sepsis cases actually had etiology detected and 4 out of 7 pneumonia cases detected. This type of information will become very important in terms of interventions, control, policy-decisions, et cetera.

In conclusion, Dr. Kapil expressed his hope that this presentation offered an overview of the types and range of activities in which the CGH is involved. He then posed the following questions that Dr. Martin asked him to share for the group to consider in addition to any other discussion they wished to raise:

- How should CDC, and CGH specifically, move towards stronger, deliberate linkages among disease control and impact strategies (e.g., across surveillance, laboratory, capacity development)?

- With the upcoming administration change, how should CGH define and present its work? The CGH was invited to participate a couple of weeks ago at the National Academies, which is developing a global health study to inform the next administration.

- How can CDC, in Atlanta and in countries, work toward ensuring health is seen as part of a country's national security issue and include respective indicators? The CGH believes that health is an important issue for GHS, and that it also is important for countries in terms of their economies, societal stability, and infrastructures.

Discussion Points

Dr. Fleming agreed that the questions posed are key and in some ways are related to each other, because of the large amount of funding that will have been received for the GHSA. This funding enables CDC to do a lot of this work, including work for a change that is not siloed by specific diseases but allows for preparation in countries to attack a range of diseases. The original allocation by Congress was a 5-year allocation with flexibility in how it is spent. It certainly is not too soon to be thinking about how to reframe part two of that so that the next administration and next Congress will see a need for continuing that set of resources for an additional 5-year commitment. He asked what work CDC has done in that respect, and if the agency anticipates continuing to use these funds in the same way or alternatively evolving it in such a way that it might be more appealing to a new President and new leadership to claim it as theirs. In addition, he wondered whether there was anything that the GWG could do either immediately or in the future to help CDC protect this resource.

Dr. Kapil said that Dr. Fleming's comments were on target. He agreed that the questions were related in terms of the work that they do and the linkages across those areas; how they do that with partners and with respect to the fiscal challenges, such as the Ebola and GHSA funding and activities being time-limited; and how they work with countries and how the new Administration and other stakeholders see the issue of health in terms of its importance to countries. The agency is thinking about these issues. A formal process is underway at CDC and within the CGH to prepare materials related to the center and agency's work for the upcoming transition for the Department of Health and Human Services (HHS) and the new Administration. In terms of bipartisan Congressional support, CDC is often mentioned as the most trusted agency in the US Government. While they are very fortunate in that regard, a lot more work remains to be done. He also mentioned that the National Academies is engaged in a separate external process on defining global health, for which CDC was asked to present input. Those types of activities and working with a broad range of partners are very important as the transition process moves forward and the members of the GWG and their organizations represent very influential stakeholders among people in public health.

Mr. DeLuca added that it is important to tell the stories. They have been doing that through different channels, but they are revisiting this to determine what other methods might be used. They already have done a lot of blogs and a lot of written stories. For example, they would like to create some video vignettes to share. He emphasized the importance of the support of various organizations to help disseminate the messages. They are in the process of assembling a more comprehensive list of the success stories.

Ms. Theroux added that they need to demonstrate the success in the country offices more. They have a footprint in over 60 countries currently, and are working very closely with country office structures to leverage the programs, portfolios, and staffing. They have very good and strong relationships with the embassies, as well

as the multilaterals and bilaterals in those countries. Ensuring that country office successes are demonstrated is a very important piece they need to work on.

Dr. Kapil said that after the recent National Academies meeting, the Academies staff reached out to CDC and specifically asked about successes in the country offices. The United States Agency for International Development (USAID) has also begun a process to reach out to all of their staff overseas. He suspects much of that will focus on the third question and there may be opportunities to highlight the importance of the public health work CDC does in those countries.

Regarding the time limitation of the GSHA funding, Dr. Farley asked whether CDC would move toward a request for subsequent GSHA funding. If so, he wondered when that came in, how they would describe what is anticipated to be achieved at the end of the first 5-year funding allocation, and what would need to be achieved with subsequent funding.

Dr. Kapil replied that there is a lot to show for the work that has been done and the work that is ongoing, such as the examples he shared. The intent for the presentation was to offer an overview of what is being done in the area of global health security work that the center and division have been engaged in. The global Zika efforts, which they would hear about during this meeting, also are very relevant. He was not sure he could answer the question regarding longer term plans, but does think that across the board, people throughout CDC and CGH (including country offices) are actively engaged in these efforts, day in and day out. In the Phase I countries, the Sierra Leone examples illustrate the type of impact that can be made in laboratory capacity, improving surveillance systems and the reporting of data, and having a trained and effective workforce. This is the first time many of these countries have had any of these types of capacities. The hope is that there will be an opportunity to continue this work, and that it can be expanded to other countries in the future.

Dr. Akhwale agreed that the questions cut across each other. An important question regards linkages with other disease programs, and definitely at the country level, this is a "big elephant in the room." It is important to build upon the investment that PEPFAR has made within countries. Quite often, the processes within PEPFAR have matured so much, it becomes a challenge for other programs to catch up. For example, Country Operation Plans have become very key documents that have a lot of focus on HIV. That is why when the question is posed about how to make GHSA a national agenda, an area that needs to be explored is how to link with the PEPFAR program and have influence before documents are produced that are national only.

Dr. Elias acknowledged the tremendous amount of progress that has been made. Reflecting on the questions, he thinks part of the challenge will be how to sustain this good work as the bolus of GHSA funds attenuate as shown on the curve. He has been struck in a number of fora by how short the memory is of the global community and politicians' post-Ebola. The memory of Ebola is fading quickly. It would be great if CDC could make a strong case for GHSA; however, they have to assume that doing so may be difficult. It is important to make the case that the time-limited, significant investment of GHSA funds actually helped to improve the performance of existing and enduring lines of work in immunization, parasitic diseases and malaria, HIV and TB, et cetera. It is also important to make the case of the benefits of activities that are known to be critical but often are invisible to people outside of public health, such as the importance of surveillance and the value of CHAMPS in helping guide further efforts in child survival, maternal mortality reduction, et cetera. He suspected

that Dr. Martin's response would be both—make as strong a case as possible for sustaining investments in global health security, but as a hedge make sure to tell the story effectively of how that new infusion of resources has benefitted programs that are likely to sustain going forward. In that regard, recruiting other allies beyond the "usual suspects" is important. The countries have been and can be quite powerful in telling the success stories of successes due to investments in PEPFAR over the last 15 years and some of the other major programs like the PMI. He also suggested thinking about reaching out to other groups that historically the public health community has not had much to do with, such as the security community. He had the opportunity in February 2016 when he attended for the first time the annual Munich Security Conference (MSC), which is the major global forum for the discussion of security policy. The Bill & Melinda Gates Foundation helped to sponsor a panel on global health security there, and it was not a public health audience. It is an audience of security professionals who think about security. Dr. Elias was struck by the strong level of interest they had in the GHSA. They largely had not been aware of it. Sometimes when public health advocates for public health, it is viewed as self-interest. But if they could recruit other groups that see the benefit of these early interventions and outbreak alerts, response, and preparedness as being important to their core interests, and to the extent that they could be advocates for sustaining this level of effort and good work for the benefit of the public, that may be helpful with regard to sustaining interest in the Administration and Congress.

Dr. Kapil agreed. The agency focuses greatly on traditional public health activities, such as surveillance. Conveying the stories of the results of surveillance efforts is very important, such as in the "real life" examples he shared. This is especially important to do in a strategic manner given all the changes on the horizon.

An inquiry was posed regarding why security professionals are interested in global health.

Dr. Elias responded that he believes they have the same range of concerns everyone has. Intentional release could be a problem, but it was more the disruption of an emerging infections such as occurred with Ebola. Not only was there disruption in the health of populations, but also there was tremendous disruption in trade, travel, business systems, et cetera that destabilized what can be already fragile states. This was clear in the recent Ebola outbreak, and there are infections that could be worse such as a highly lethal influenza pandemic. The security community is concerned about this in addition to the potential for bioterrorism.

Dr. Kapil indicated that CDC also has been engaged in some specific areas with the security community, such as intentional releases, chemical and radiation events, the linkage between law enforcement and the public health community, et cetera. That is one of the Action Packages. A group at CDC in NCEZID has been engaged in that type of work.

In terms of other potential support for the GHSA, Ms. Theroux added that there is a major economic impact. Collecting the type of data that can show that impact in country and in international trade is important.

Dr. Kapil indicated that this was one area of discussion at the recent World Bank meeting. It is a major area that probably needs more attention.

Dr. Dowdle said that in his experience in public health over the years, he thought they had learned the hard way, and often repeatedly the hard way, about going into communities and countries and saying, "This is what you need to do" versus working with communities in partnership. He observed that an important component missing from the first question was country-sensitive and community-sensitive programs. For example, there could be country-sensitive, community-sensitive linkages that put the community into the concept. This is very important in making the case, as well as in being a welcomed partner in countries and communities. To him, it is very gratifying to see the additive that CDC has incorporated over time. That type of research is extremely important in public health and needs to be made more prominent.

Dr. Fleming pointed out that there would be a unique opportunity the next day during the ACD meeting to make recommendations. The ACD meeting is designed in part to highlight issues that the new leadership and new Administration should be attending to as top priorities during their first 100 days when trying to figure out their direction. The GWG may want to consider raising the issue that the funding allocated for global health security has been wisely invested and is producing results, and that this has been a great investment. The GWG may wish to articulate for the new Administration that the strategy for continuing that work by assessing global health security needs and the utility of improving countries' ability to handle daily needs are great benefits to the US. They could choose as a group to make a recommendation to the ACD to be carried forward to the new Director to pay attention to this issue.

Dr. Farley said he thought this made a lot of sense. So they can sell this in a concise way, he suggested including some very simple accounting for what has been / will be accomplished and what will remain to be done by the end of the funding cycle that will require additional funding.

Dr. Tomlinson added that also important to articulate is that in country offices, the GSHA is one of the things that has the ability to work across systems instead of in silos. It can be a "glue" that brings other investments together and amplifies their contribution. PEPFAR has done a lot of this historically. There was some purposeful and some incidental system strengthening over time. That scope and vision has narrowed and is very specific moving forward. Other Presidential and global initiatives might have had the same sort of contraction. Global health security resources provide an opportunity for filling in some of the gaps that now exist with the narrowing of focus for other initiatives. These cross-cutting system investments amplify, accelerate, and magnify the effects of those other vertical programs. Disentangling exactly what those metrics are and how the indicators move because of it will be hard, but in a country office they see this in a very real way. It is important to think about and carry forward.

Dr. Wolfe agreed with Dr. Tomlinson's comments about the experiences in countries. Despite whatever the appropriation language says, they have had the ability to invest in systems-strengthening that has waxed and waned in countries depending upon different settings. Many countries have worked quite a bit to find metrics, and this has been a major challenge. They tend to be process indicators versus outcome and impact indicators, partially because it is hard to directly associate them and also because there is hesitation to take credit for impacts where there were many different inputs. While he said he did not know how to solve this, it is a really hard sell to appropriators and Washington.

Zika Activities

Global Zika Response Activities

Alexandre Macedo De Oliveira, MD, MSc, PhD (Coordinator for Global Zika Activities, Center for Global Health, Centers for Disease Control and Prevention) provided an update on global Zika response activities. He explained that the international strategy is evolving and has two main objectives for populations at-risk internationally and domestically, which are to: 1) Minimize the number of pregnancies affected by Zika virus infection; and 2) improve the understanding of Zika virus to predict the long-term consequences and help design control and prevention measures for affected countries and populations at risk. A lot of this work has been funded by an interagency agreement. The funds are allocated into six categories: surveillance, epidemiology, and public health studies; laboratory capacity; maternal and child health interventions and service delivery; vector control; emergency operations and management; and innovations.

CGH leadership also believes that a lot of what is done internationally has impacts domestically and vice versa. For example, a cohort study that is underway in Colombia is anticipated to strengthen the understanding of adverse pregnancy outcomes. Hopefully, that work will provide some evidence that will help design the pregnancy and birth defects response in the US as well. In addition, there is the aerial spraying experience in Florida. This experience will be assessed to determine how applicable or not it is for other countries. These and other Zika international and domestic response synergies have the potential to strengthen the global public health system's capacity to prevent, detect, and respond to disease outbreaks as part of the GHSA. In addition, the knowledge and experience from the international response can be used to inform the domestic response by identifying best practices to protect pregnant women and vulnerable populations. Understanding Zika virus effects in endemic countries is essential to improving the overall response.

The three pillars of the GHSA are prevention, detection, and response. The prevention objectives are to: 1) improve development, evaluation, and implementation of novel prevention, detection, and response strategies, particularly to prevent new infections in pregnant women; 2) increase the understanding of Zika epidemiology in epidemic and endemic countries; and 3) increase understanding of Zika virus long-term impact on human health. The detection objectives are to: 1) improve surveillance of Zika virus infection and monitoring of pregnancy outcomes; 2) improve diagnosis of Zika virus infection; and 3) strengthen vector surveillance, including enhanced testing for insecticide resistance. The response objectives are to: 1) improve access to Zika-related services and commodities for pregnant women; 2) strengthen vector control, including integrated vector management activities; and 3) enhance capacity for emergency response and risk communication.

In terms of the areas of work that are underway to fulfill these objectives, for prevention there are a number of efforts to close knowledge gaps, which include: 1) surveillance of adverse events in Zika-infected pregnant women; 2) innovations in diagnostic, vector control, and risk communication; and 3) operational research and evaluation of Zika epidemiology and ecology. Areas of work to achieve the detection objectives include: 1) capacity building in epidemiology and public health; 2) Zika surveillance in pregnant women and general population; 3) laboratory diagnostics, supplies, and training; and 4) vector surveillance and insecticide resistance monitoring. To accomplish the response objectives, areas of work include: 1) implementation and evaluation of

integrated vector control management (IVM); 2) emergency response and risk communication support; and 3) case investigation of Zika reports.

It is important to highlight that this is a two-agency strategy. CDC traditionally has engaged in prevention and detection, while USAID has an extensive record of response. Thus, this is not primarily CDC-focused. This work is being implemented through a CDC-USAID Interagency Agreement. Congressional notification was received in April 2016, which awarded $295 million for the global emergency response that was allocated in the following manner:

- $ 137 million to USAID
- $ 158 million to CDC
    - $ 80 million for Ebola
    - $ 78 million for Zika ($ 50 million to external partners)

CDC allocated the $78 million for Zika as shown in the following table:

CDC Zika Response

Category	Funding ($)
Vector management	7,000,000
Maternal and child health	1,000,000
Laboratory capacity	15,000,000
Innovations	5,000,000
Surveillance, epi and public health studies	44,000,000
Emergency response	6,000,000
Total	78,000,000

The CGH was asked in April and May to select activities that would help implement the agency's strategy and help direct the funds from the interagency agreement. The first step was a call for proposals from CDC centers and divisions, including Emergency Operations Center (EOC) Zika Response Teams. A prioritization process was completed for the proposals received with leadership from the CGH and the leadership of the Zika response at the EOC. Projects were selected from different centers, with a balance between programmatic and research-oriented projects to help decrease the knowledge gap. The criteria used to select the proposals included: 1) the opportunity to contribute to international development with a direct link to Zika response; 2) how the proposed work would be complementary to USAID activities; 3) the availability of implementing partners and mechanisms; 4) the short and medium timeframe of proposals, given that the timeframe for projects was a little over 1 year and proposals had to be selected from among projects that could provide results in that timeframe; 5) balance among countries and technical areas; and 6) available funding levels. Examples of projects that were funded and are being implemented currently are shown in the following table:

Category	Activities
Vector Control	• Reinforcement of institutional capacity, especially in Central America and the Caribbean • Evaluation of current and novel methods for vector control
Maternal and Child Health	• Surveillance for Guillain-Barré and neurological long-term complications
Laboratory Capacity	• Support through training and supplies • Strengthening of laboratory networks and integration with surveillance • Collaboration in endemic countries
Innovations	• Development of new molecular and serological testing tools • Use of recombinant antigens • Evaluation of novel vector control strategies (Wolbachia-infected mosquitoes)
Surveillance, Epidemiologic, and Public Health Studies	• Support for Zika infection, birth defects, and vector surveillance systems • Follow-up monitoring of pregnancies for malformations and developmental disabilities monitoring • Impact of vector control in disease burden • Support to field epidemiology training programs

There are a number of challenges. The funds are time-limited, so it is important to work judiciously to complete projects with short timelines and to show results quickly. However, research takes time. There is a broad scope of activities, which can be challenging. Coordination and communication across centers and with many countries can be complicated. Partnerships and established relationships are quite variable in each country, and there are limited CDC staff members in certain countries. Dr. Macedo De Oliveira emphasized that he personally is grateful for this opportunity to collaborate with CDC's partner countries and US government counterparts, for CDC staff to be able to work in all types of core public health activities for CDC, to advance / implement CDC's portfolio of public health activities in the Americas, and advance the scientific knowledge about Zika that will support future efforts.

National Center for Birth Defects and Developmental Disabilities (NCBDDD) Zika Activities in Latin America

Coleen Boyle, MD (Director, National Center for Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention) presented an update on the NCBDDD's Zika activities in Latin America. She explained that although she was representing NCBDDD, the way they work in the EOC is under one umbrella. Her center has helped support one of the teams, the Pregnancy and Birth Defects Task Force. She explained that it is referred to as a task force because it is such a large team. While NCBDDD has undertaken a number opportunities as part of that team, there a number of other smaller projects underway. She emphasized that she did not want to give the impression that these are the only activities. For example, there is an Influenza

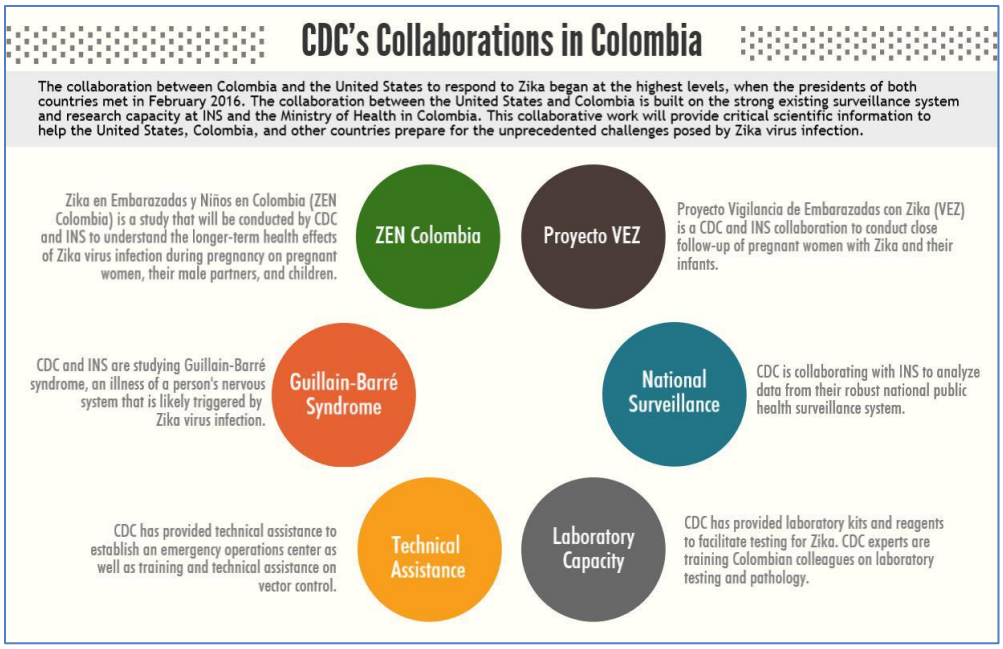
Cohort Study being conducted in Panama and El Salvador by NCBDDD's colleagues in the National Center for Emerging and Zoonotic Infectious Diseases (NCEZID). This study has identified 100 pregnant women as infected with Zika, and they will be following up that cohort. NCBDDD's activities involve a larger number of women and pregnancies, which will provide the major science that will come out of the response.

In terms of NCBDDD's surveillance capacity, since February 2016 they have developed major surveillance capacity. Zika is much more of an issue in the territories versus in the Continental United States (CONUS) where most of the cases are travel-associated. The work in the territories, Brazil, and Colombia has been bundled together. Each of the activities are striving to perform the same type of work to get a better picture of the impact of Zika virus infection in utero on the pregnant woman, both in terms of whether there are any maternal effects and with regard to whether there are any fetal effects in general. There are four complementary surveillance systems in place for women, fetuses, and infants. The first is a very robust CONUS-based reporting system known as the US Zika Pregnancy Registry (USZPR). The USZPR is on the CDC website and the numbers are updated weekly. At this point, close to 800 women are enrolled in this system. The second is the Zika Active Pregnancy Surveillance System (ZAPSS) in Puerto Rico of women who have been identified with confirmed exposure. The newest component added with the new findings is the US Zika-Related Birth Defects Surveillance System. Because it is known that the vast majority of travel-associated cases are being missed, this system is focused on the birth defects angle to assess congenital Zika syndrome and the neurologic consequences surrounding that as another way to try to identify cases being missed. The final component of surveillance in the Proyecto Vigilancia de Embarazadas con Zika (Proyecto VEZ), which is the Colombia system. The priorities of this system are public health surveillance, epidemiology, laboratory, vector, and other public health response activities related to Zika virus in Colombia. This system is very comparable to the first two, and involves a very intense look at pregnancy and Zika exposure in pregnancy. It is mostly symptomatic women, so the difference between the USZPR and ZAPSS and the last system is that Proyecto VEZ is comprised primarily of women who have symptoms during pregnancy; whereas, the vast majority in the USZPR system are asymptomatic. Cases are being found of congenital Zika syndrome in women who do not have symptoms in pregnancy. Close to 900 travel-associated cases have been identified in the US, and close to 1900 have been identified in the US territories, which is primarily Puerto Rico).

With regard to Puerto Rico, ZAPSS is a very active surveillance program. The guidance is to test all women for exposure in Puerto Rico who are pregnant. Pregnant women are tested as soon as they are enrolled in prenatal care, at 20 weeks, and when the baby is born. Though that is the guidance, it is not necessarily being carried out that way. But that is how women are being captured to be part of the surveillance program. Once women are identified, abstractors extract information from prenatal care records. They identify any imaging of the fetus at that point, and subsequently follow that pregnancy. The scope of the work is growing tremendously. The hope is that they will be able to follow those children through the first three years of life. Currently, the reporting in ZAPSS is in terms of actual case reporting. Reporting is on hold because there was a disagreement with regard to a case definition, so they are trying to work through those issues such that they will be able to start reporting the outcomes from ZAPSS. One very important issue that they have been able to address successfully in Puerto Rico is protecting women from pregnancies for those women who do not want to become pregnant. It was discovered early in the response that the vast majority of pregnancies are unplanned. Generally it is said that 50% of pregnancies in the US are unplanned. It is much higher in Puerto Rico. In addition, women did not have access to the full range of contraception.

CDC Zika EOC worked very hard with the CDC Foundation and federal partners to develop a network of trained providers who are able to provide the full range of contraceptive access and services. This is being done through the Zika Contraception Access Network (Z-CAN), which was developed to build a network of trained physicians and staff at clinics across Puerto Rico to provide the full range of reversible contraceptive methods to women who want to delay or avoid pregnancy during the Zika outbreak. Z-CAN provides training on client-centered contraceptive counseling, intrauterine device, and implant insertion and removal and will increase provider awareness about the need to screen women about their desire to achieve, delay, or avoid pregnancy during this Zika outbreak. Z-CAN also will increase the supply of a range of contraceptive methods, including long-acting reversible contraceptives (LARCs), and ensure that women in Puerto Rico who wish to delay or avoid pregnancy are able to receive comprehensive, client-centered contraceptive counseling and same-day access to the full range of contraceptive methods at no cost. This need was identified based on a number of focus groups conducted with women there, in terms of preventing pregnancy until there is a safer time in the context of Zika. This has been a very successful activity in that context.

A lot of energy is being invested in Colombia. CDC has a great relationship with the equivalent of a National Institute of Health (NIH) in Colombia, so they are working on both the public health response piece of that (surveillance) as well as the research piece. The priorities of Colombia are very comparable to the priorities in the US, including getting a better sense of the impact of Zika in pregnancy on the fetus. An effort is being made to quantitate risk. There is some sense now of what the risk is in the first trimester, but not as much is known about the second and third trimesters. Other neurologic findings also are of interest, including Guillain–Barré Syndrome (GBS). Strengthening laboratory capacity for serologic and molecular diagnosis of Zika Virus (ZIKV) infection also is a priority, which is very challenging. Evaluating the effectiveness of vector control measures also is important. Colombia's mission and how well it dovetails with CDC's mission is depicted in the following graphic:



Expanding on the strong foundation provided by Sivigila, an intensive surveillance project in Colombia, Zika en Embarazadas y Niños en Colombia (ZEN Colombia), was established to enhance national surveillance of pregnant women in three cities: Barranquilla, Cúcuta, and Cali. The primary objective is to evaluate the relationship between Zika virus infection during pregnancy and adverse pregnancy, birth, and infant outcomes; identify the spectrum of adverse fetal and infant outcomes associated with congenital Zika infection; and estimate the risk of each adverse outcome by trimester of maternal Zika infection. The plan for ZEN Colombia is to enroll 1000 women in pregnancy, or close to that goal. The women enrolled will be followed prospectively comparably to what is being done in Puerto Rico. The specific objectives are to:

- Assess knowledge of ZIKV symptoms, transmission, and prevention in pregnant women and their male partners
- Identify risk factors for ZIKV infection in pregnant women, their male partners, and their infants
- Assess and characterize the risk for adverse maternal, fetal, and infant outcomes associated with ZIKV infection
- Evaluate risk factors for adverse maternal, fetal, and infant adverse outcomes following ZIKV infection in pregnancy

The objectives listed are the objectives for the emergency response only. The cohort design and the nature of the information collected will allow for many lower-priority research studies to be conducted within this cohort in the future, based on the information collected as a part of the response or based on data collected as sub-studies. For example, newborns are currently being followed through 6 months of age, but the hope is to extend follow-up through age 5 to capture health outcomes that might be identified only at older ages such as learning disabilities or autism, which would not be noticeable at 6 months of age. Follow-up is not active. The healthcare system is used for enrollment of women and information on issues arising during pregnancy, and similarly in terms of the babies.

The cohort study is very similar to the cohort study NIH is conducting. NIH is funding a multi-site study, with a plan to enroll 10,000 women in pregnancy. The study CDC is conducting in Colombia is soon to be launched, with an objective to enroll 5000 women in pregnancy. Some of these women will be identified and enrolled prior to pregnancy, and their male partners will be enrolled as well in order to better understand sexual transmission and the risk of sexual transmission. Currently, the hope is to be able to follow babies actively through the first 3 to 5 years of life. It would be ideal to follow the babies through the first 5 years of life. At this point, there is a good sense that Zika causes what is now referred to as congenital Zika syndrome, which is the most severe outcome. It has been suggested by CDC's Colombia and Brazil colleagues that there are consequences of infection that occurs later in pregnancy, which are not as dramatic. Even for infection that occurs in early pregnancy, some babies who are born apparently normal, develop reduced head size resulting in ongoing neurologic consequences as infancy progresses. Therefore, the desire is to be able to follow all babies in the study who have had infections in pregnancy.

CDC's work continues in Brazil, which Dr. Boyle described during the April 2016 GWG meeting. At that time, they had just completed a large case-control study in Paraiba, Brazil—one of the states near Pernambuco. This area was most severely impacted by last year's outbreak. There is a very large case group, with 3 controls per case. There are 3 case groups, because back then it was unclear how to define congenital Zika syndrome. Therefore, a liberal approach was taken to enrolling babies for the case groups. The testing of mothers and

babies took a long time, but has recently been completed. There were issues with regard to cross-reactivity and the fact that some of them were older and it was hard to determine whether they actually were exposed in pregnancy. The study is essentially completed; however, CDC will be meeting with the Ministry of Health (MoH) to present the findings before they are shared with others. CDC currently has a team in Brazil who is working with colleagues at CDC Brazil and the MoH. There is a lot of interest in being able to follow up all of the babies, as well as the control babies who did not have a recognized phenotype at birth, but actually had exposure. Exposure was so widespread, some of the controls clearly had exposure. The goal is to try to constitute a cohort of children from the case-control study, follow them, and evaluate them through a fairly intensive neurodevelopmental evaluation at 18 months of age. This activity is planned for early 2017.

Discussion Points

Dr. Farley asked what either Dr. Boyle or Dr. Macedo De Oliveira could tell them about the epidemiology of Zika in the Caribbean and Central America over the last 6 months or so, in terms of whether an epidemic wave has come and gone. He also asked what they could say about the epidemiology where the disease first appeared in Brazil, which might offer some insight into what might happen next year in Central America and the Caribbean.

Dr. Boyle replied that they get weekly reports from the arbovirus surveillance network (ArboNET), which tracks actual viral infections for Puerto Rico, Samoa, and the Virgin Islands. For Samoa, the epidemic has waned. The last cases were identified in late spring to early summer. For the Virgin Islands and Puerto Rico, an increase in cases is still being observed. Zika remains very active in those places. As a matter of fact, cases have increased in the last month or two in the Virgin Islands. Very active transmission continues to occur in that area. The same is being observed in South Florida. There is discussion because the virus ebbs and flows, it is unlikely to subside for a while. Ebb and flow is observed around dengue, chikungunya, and other viruses that are carried by mosquitos. Therefore, it probably will be around for a while. In Brazil, a second wave of the infection occurred. There was the early 2015 wave, with the consequences of that observed in babies in late 2015 and early 2016. Another outbreak occurred in Brazil. Colombia was probably 6 months later than Brazil in their initial outbreak. This is why CDC wants to start the cohort when the second outbreak is anticipated to occur.

Dr. Macedo De Oliveira added that this is his point of view as well. There are some countries where infection is decreasing, and it was anticipated that there would be a 2-wave type of behavior. It also is important to remember that it is related to mosquito transmission itself, so areas of Brazil that experience dengue have Zika every year. What is being observed may be a reflection of the vector itself. To what extent there will be a second wave in the Caribbean and South American remains to be determined

Dr. Farley pointed out that 6 months ago, people were very pessimistic about what was going to occur in Puerto Rico because it is so difficult to deal with this vector. He asked whether there was any evidence anywhere that transmission has been reduced through vector control.

Dr. Macedo De Oliveira replied that he did not believe this evidence was available yet. The vector is a big challenge to control. That is why some programs have so many activities. Mexico has its own vector control programs and is one of the sites now to evaluate a new model that has more focus. Efforts like that will be able to provide some evidence about what type of vector control works best.

Dr. Dowdle wondered if Dr. Boyle and Dr. Macedo De Oliveira would like to comment on their role with PAHO, PAHO's role in all of this, and their interaction.

Dr. Macedo De Oliveira said that from their perspective, CDC is engaged with PAHO in laboratory diagnosis, surveillance, and vector control. CDC has a liaison at PAHO and PAHO has a strong role in laboratory diagnostics. PAHO is one of the recipients for funding for laboratory training in the region, so CDC has close collaboration with them. CDC also has a strong relationship with PAHO in vector control. Mainly in South America, with some experience in Central America as well.

Dr. Boyle noted the success in Florida that was illustrated recently in the *Morbidity and Mortality Weekly Report* (*MMWR*) regarding a combination of spraying aerial larviciding with *Bacillus thuringiensis israelensis* (*Bti*), which resulted in reducing the mosquito population. There was a lot of pushback in Puerto Rico about aerial spraying. However, the new independent Puerto Rico Vector Control Unit (PRVCU) was established with seed funding provided by CDC. In addition, two types of traps are being used in fairly large volume in Puerto Rico. There is a good evidence base around these traps, so they are being placed in certain areas. The success that occurred with aerial spraying in South Florida is not being replicated in Puerto Rico. CDC has a good working relationship with PAHO in terms of pregnancy and birth defects. They are working on a case definition and reporting, and are working with all of their clinical colleagues who help bridge those gaps. PAHO has been very helpful, and has played a leadership role in trying to facilitate prevention; the care of children; and mental health, stigma, and other issues associated with congenital Zika syndrome.

Regarding the duration of the conditions in Haiti due to the recent hurricane, Dr. Marquez asked whether there been an assessment of the effect of Hurricane Matthew on vector control. He wondered whether any thought had been given with regard to how to boost Haiti's capability to fight vector control. Over the last couple of decades, there has been a process of dismantling of vector control agencies, for example, in Brazil. Those functions supposedly were to be transferred to local governments as part of the development of a national health system. Local governments did not have the capacity to perform those functions. In terms of the research agenda, he asked whether CDC was contemplating any studies to test delivery approaches that integrate the public health provision and the service provision he mentioned.

Dr. Macedo De Oliveira responded that Haiti worries him. Haiti is responsible for some of the outbreaks of Malaria. Recently, they reviewed travelers to the US. The proportion of Zika cases brought to the US came from Dominican Republic, which suggested that there might be a link to Haiti. This has to do with suspected transmission. For that reason, CDC was asked to take a deeper look into the transmission of Zika in the Dominican Republic, for example. CDC does have a surveillance program of pregnant women in Haiti. At the beginning of the response, CDC did have some data from Haiti. The number reported was very low compared to the number of clinical cases. The reason is that there is an infrastructure issue there that is very hard to solve. There is one disaster after another, so there are ongoing challenges. There are relatively strong activities in the Dominican Republic, so they are able to see what relationship there is to neighboring countries. In terms of the broader implications for the whole Caribbean or Central America region, CDC does not have this information but has a vision of this. Decentralization of the vector control program is a major issue. Good examples of vector control in the world have come from situations in which control has been very centralized and very militaristic at

some point. A lot of that has been lost. CDC does not have research on the complications of that per se. He thinks that some of strategies that are going to be implemented are going to be relatively vertical. All they can do is show the evidence and hope that it will be enough to change their mindset. In terms of how to use events like this to provide more long-term benefits, major partners and major donors must show that laboratory capacity, public surveillance, and staffing capacity are crucial and that there will be long-term effects including national security. One way is to show that while it began as Zika-related, it also is public health more broadly. Working on the capacity of locals for surveillance is problematic. This is one of the ways he can think of to overcome that.

Dr. Elias asked for additional information about the sustainability of funding for the Z-CAN program. The Gates Foundation and a couple of other philanthropy organizations worked with the CDC Foundation to provide some support during this period where exposure was increasing. He asked whether CDC now has sustainable funding with the recent Congressional appropriation

Regarding the question about sustainability of Z-CAN, Dr. Boyle stated that CDC dollars were not allocated towards developing or sustaining that effort. As noted, that was a privately funded effort. It was wonderfully successful, but it is obviously not sustainable. Training physicians was a wonderful decision, because they have been able to carry on services. Her understanding is that the dollars that have gone to Centers for Medicare and Medicaid Services (CMS) are being directed to Puerto Rico for that issue. Hopefully, some of that will help with sustainability.

Dr. Farley requested information about sexual transmission occurring after the vector-based wave, and whether there is any reason to think that sexual transmission could be a continued self-propagating mode of transmission. He also asked what important needs CDC would like to have additional funding to address.

Dr. Macedo De Oliveira replied that he did not think there was enough knowledge at this point regarding how much transmission may be propagated by sexual transmission alone. In terms of some of the cohorts of pregnant women in the surveillance system, they may be able to infer this, at least for sexually active women. There are some studies being conducted by NCEZID of how long the virus survives in semen and other body fluids, so this information will be available. He thought the longest timing observed thus far had been 110 days. Regarding additional funding needs, Dr. Macedo De Oliveira that at this point, it is crucial to make sure surveillance systems are good. There is a lot of work that must be done “behind the scenes.” CDC, PAHO, and others get together to define key issues. Having operating systems in countries is crucial. Another major issue in countries with high rates of disease still, such as Brazil and Colombia, is the impact of that on the public health systems or health systems due to the outcomes that will be coming.. There also is vaccine development work in which CDC is involved in terms of using existing infrastructure and knowledge to determine where those studies could or should take place.

Dr. Boyle added that thinking globally, there is a lot of interest on the part of the WHO and countries in setting up the capacity to conduct birth defects surveillance and including congenital Zika syndrome and other preventable causes of birth defects within that context. Another critical issue is diagnostics. A test is needed that can be used in countries. There will be a broad area announcement pertaining to diagnostic technology development, which is an area that would benefit greatly from more money.

Mr. DeLuca pointed out that there are needs with respect to communication as well. CDC has been able to engage in some risk communication activities this year, and has been working closely with PAHO and others to address this. Some great work has been done in Puerto Rico from a health promotion perspective and the development of some initial campaigns, which included some Gates Foundation funding as well. They want to use the lessons learned in the Americas and beyond. PAHO is interested in this based on initial discussions, but there are not resources currently. A lot of the health promotion efforts have been vector control-based versus sexual transmission of Zika, which is another area where there is a major need.

Pointing out that vaccine development is probably a long time coming, Dr. Dowdle asked whether CDC is engaged in any planning regarding vaccine trials and how vaccines might be used.

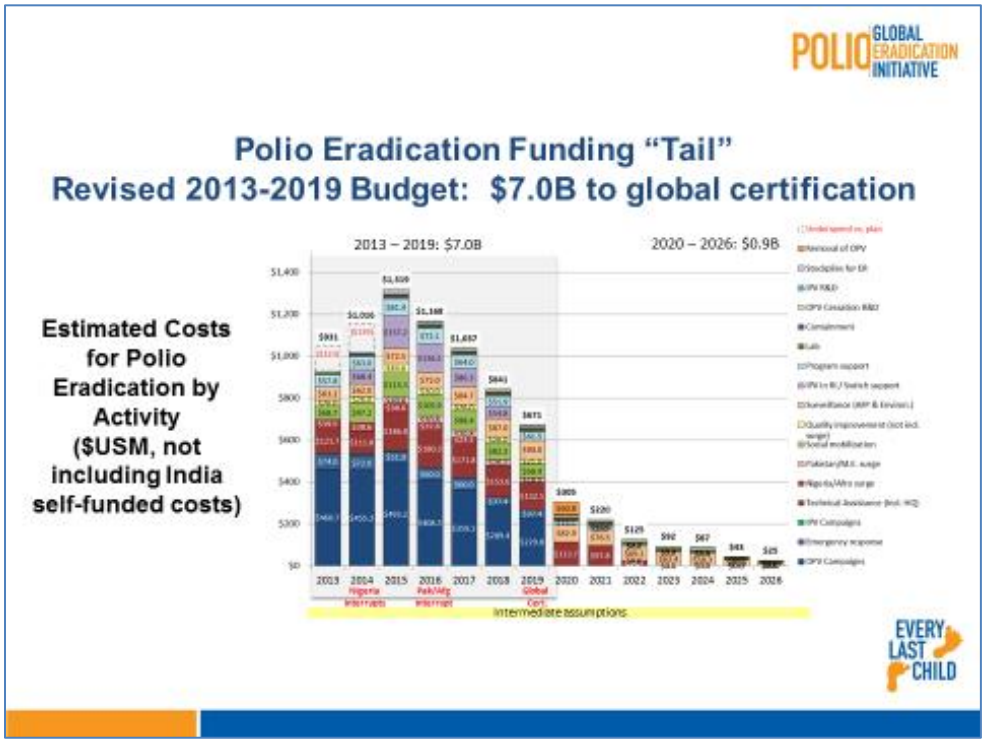
Dr. Macedo De Oliveira responded that CDC has some experience with the development of the deoxyribonucleic acid (DNA)-based West Nile Virus (WNV) vaccine in the past. CDC is involved in helping to select sites for vaccine trials, and will likely participate in determining measurement.

Dr. Marquez emphasized the importance of ensuring the stability of all of these investments. A great deal has been learned about how, after a crisis passes, systems collapse. This was observed with avian influenza, and that semblance of behavior has been seen in terms of Ebola. When allocating these resources, perhaps there is a need to contemplate getting firm commitments not only to complete the activities related to the investment, but also to find out where there is a commitment to plant the seeds that will allow for sustainability to grow. In making this observation, perhaps it would be very useful to look at the new funding arrangement that has been developed by the Global Fund, which has different categories of co-financing by income level. He thinks it would be important to build upon an arrangement that will help ensure sustainability once CDC walks away.

Dr. Macedo De Oliveira agreed. If history repeats itself and Zika remains a public health problem like Dengue, co-funding may work to their advantage in these countries.

Polio Update and Polio Transition

John Vertefuille, PhD (Chief, Polio Eradication Branch, Global Immunization Division, Center for Global Health, Centers for Disease Control and Prevention) presented an update on polio, the polio transition process, and why CDC is pursuing the transition process. The following graphic depicts the polio eradication funding which reflects the overall $7.0 billion budget, with estimated costs for polio eradication by activity not including India self-funded costs:



For the purposes of this presentation, Dr. Vertefuille pointed out the tail end on the right side that goes beyond 2019. For a variety of reasons, that represents about $1 billion in costs that go beyond the period. The truth is that there is a subset of activities that will be required for securing and maintaining a polio-free world that actually will occur for a quite some time after eradication.

In terms of the size and scope, the Global Polio Eradication Initiative (GPEI) is a very large partnership that involves 80,000 personnel throughout the world; millions of vaccinators; a global network of 146 laboratories in 92 countries; incredible institutional capacity, processes, and knowledge to reach the most difficult to reach populations on the planet; microplans, monitoring mechanisms, accountability processes, et cetera; and an average cost of approximately $1 billion per year. A fundamental shift over the last few years has been one of accountability at all levels. Sometimes it is easy to forget how critical that is. In many instances, particularly in places where systems are sluggish, it is critical to develop ways to insulate the resources to make sure they end up where they were intended. That is a unique capacity of the GPEI.

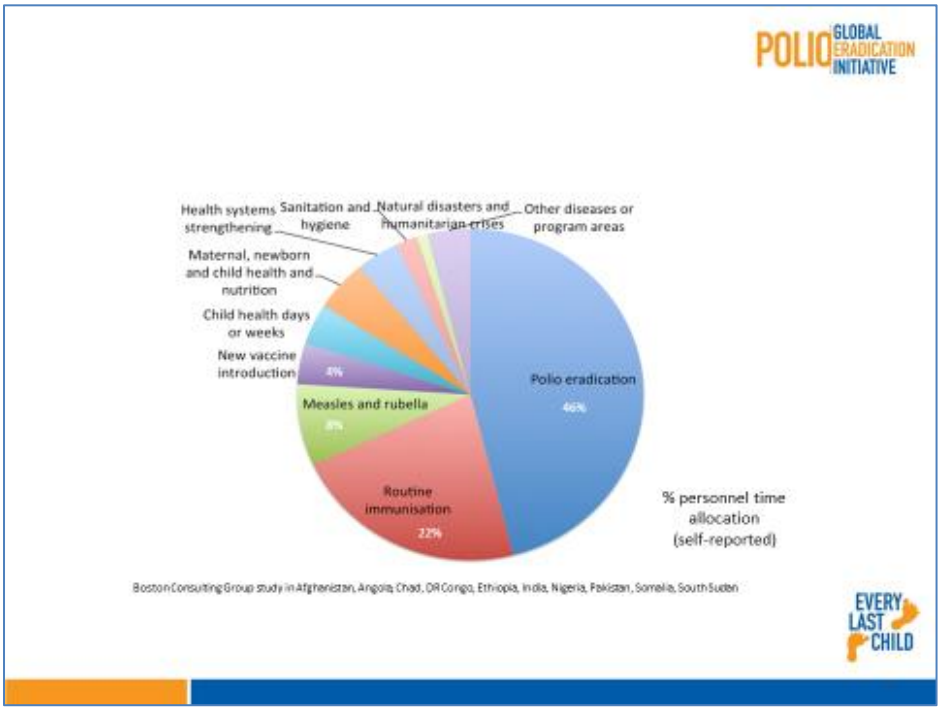
In terms of why post-polio eradication is being considered, there are certain essential polio functions that will need to be maintained after certification, including: surveillance and laboratory programs, immunization programs, outbreak response, vaccine stockpile, and biocontainment and biosafety. "The Polio Eradication & Endgame Strategic Plan 2013-2018" includes an objective, Objective 4 that is devoted specifically to polio transition. Objective 4 originally was termed "Legacy Planning" but shifted to be called "Transition Planning." The function is the same, which is to *"…ensure that the investments made to eradicate poliomyelitis contribute to future health goals, through a programme of work to systematically document and transition the knowledge, lessons learned and assets of the Global Polio Eradication Initiative."* That is, there are incredible human assets and knowledge. It is important to ensure that the lessons learned from polio actually are documented and then

applied to other efforts where appropriate. In terms of the case for transition planning versus at some point in the future, first there is a need for essential polio functions to continue after eradication is achieved to protect the polio-free world. Second, there is a risk to other health goals when GPEI funding stops, as the polio infrastructure is already helping to support other health programs. Third, there is an opportunity for current GPEI staff, assets, and knowledge to contribute to other health goals.

With respect to what is needed for polio transition planning, the way that GPEI has framed this is that everything will roll up into a global transition plan. However, the fact is that a global plan alone without these component parts would not be sufficient. While the global plan is a framework, it also will include plans from each WHO region that address specific needs for regional coordination and those of non-priority countries. Currently, there are country plans in at least the 16 priority countries. In terms of organizations, each of the 5 GPEI core partners and any other key partner organizations are required to develop polio transition plans. The plan also will include high level advocacy and communication of the purpose and meaning of polio transition planning.

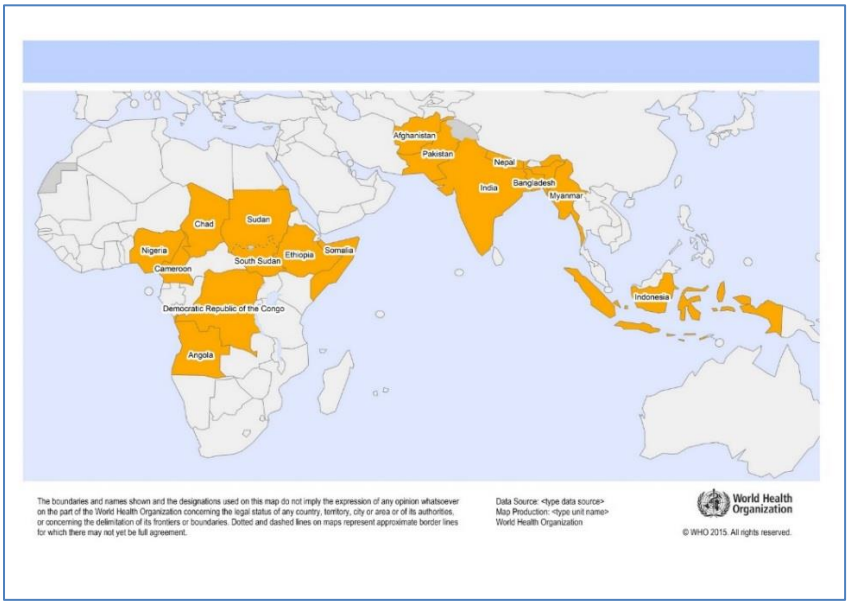
GPEI has learned many, many lessons on the road toward eradication in terms of accessing insecure and hard-to-reach areas, accountability, communications, social mobilization / community engagement, working in complex global partnerships, achieving and maintaining political commitment, and global disease surveillance networks. It is important to consider how these lessons can be used for greater benefit. Dr. Vertefuille was the CDC Country Director in Nigeria from 2005-2008. At that time, the headlines in the news were “Polio vaccine causes sterility” and there was a complete ban on polio vaccination. There was a real resentment in that country to perform vaccination at all. This view was very entrenched, and it was not particular to Nigeria. This also is observed in parts of Afghanistan and Pakistan, though there are fewer issues in Pakistan currently. There was a very deliberate and focused shift in how communications were done, with engagement at the village level with religious community sectoral leaders and using all assets, such as polio survivors, to change the message and talk about why polio vaccination was important to those communities, educate them about the benefits of polio vaccination, and get them to commit to vaccinating their children. It is important not to lose that communication capacity moving forward. Linked to that is social mobilization. In terms of maintaining political commitment, in Borno the governor is writing into the work requirements for people at the level below him that he appoints that they must focus on polio or they will not be welcomed. That is a very deliberate way to have leadership, not just at the national or state level, but at all levels engaged in the delivery of a health service. With that kind of engagement, the outcome can truly be changed because it really helps with the accountability measures coupled with that.

A recent study was conducted to assess how polio staff spend their time. GPEI-funded staff already report spending more than half of their time on health priorities other than polio as depicted in the following pie chart:

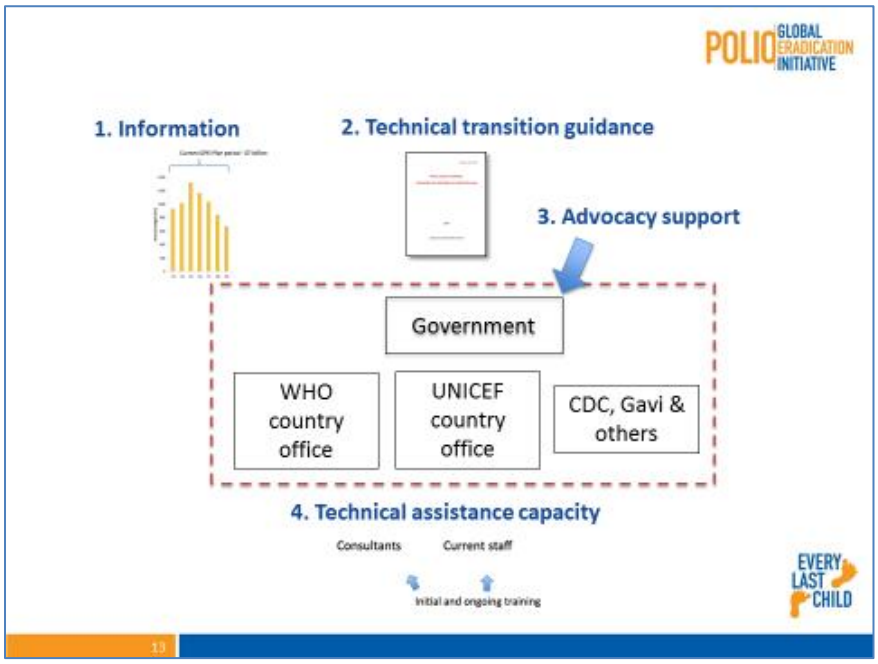


Polio-funded staff for a country often are required to collect not only polio surveillance information, but also other routine immunization information. They also may be involved in helping develop national planning for introduction of vaccines and other routine immunization strategies. They are involved in a range of other maternal and newborn health initiatives. This makes the point about the risk for potential harm to some of these other programs if there is not an appropriate plan.

That raises the fundamental question, "What will happen to the human resources and lessons learned?" To address this question, the transition process developed by GPEI has four main elements. These elements are to: 1) prioritizing the high-investment countries (16 priority countries) to make sure they have country plans; 2) making sure that those are coupled to cohesive and thoughtful regional plans and the global plan; 3) making sure that each of the 5 agencies have an agency-specific plan that aligns with and interdigitates will with the regional and global plans; and 4) ensuring that there is a close global collaboration across the partnerships to document and share lessons learned broadly. The following is a map of the 16 prioritized countries:



The following is a schematic of what country-level transition planning would look like:

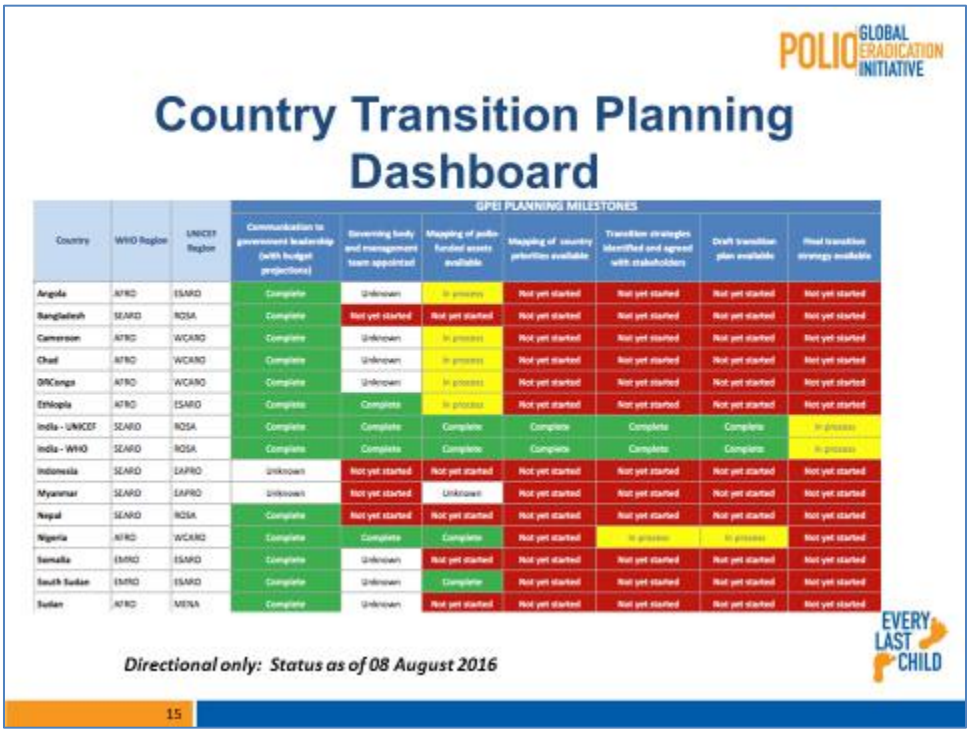


This effort is country-led with GPEI support. Information would be gathered and technical transition guidance would be developed that would involve numerous relative stakeholders (WHO Country Offices, UNICEF Country Offices, the 16 countries, CDC, GAVI, development partners, and others). India and Nigeria have done a fair amount of planning, India more than Nigeria. The relevant stakeholders then determine what the assets are, how to determine which should be continued, how each of them might change, and how to prioritize them. The planning steps a country would take are as follows:

- *Awareness*: Ensuring government engagement and country leadership

- *Coordination*: Identifying governing body and coordination / management
- *Evidence*: Mapping polio assets and country health priorities
- *Strategic Options*: Transition planning workshop / simulation exercise with a broad group of stakeholders, including partners and donors
- *Vision for the Future*: Draft transition plan shared with stakeholders for input
- *Roadmap*: Jointly agreed strategy for moving forward, with funding commitments and execution roadmap

This is a dashboard from August 2016, so it is somewhat out of date. It is still early in the transition process, so it is not as bad as it looks in terms of the red cells. The dashboard does reflect how far India has come in transition planning, and they are on the cusp of having a draft document that will be shared externally in the next couple of months. Nigeria recently completed its mapping exercise and has started the prioritization exercise that follows that:



Regarding the global and regional polio transition plans, the GPEI partnership believes that there should be a single global plan created through input from all five core partner agencies. The global plan and any additional agency-specific plans should be aligned with one another. The planning process will actively seek inputs from a broad range of partners. Because it will impact the broader health systems, and because some of the solutions may require vastly different resourcing, planning, and outputs than the polio program, it is critical to engage external groups early (Global Fund, USAID, and other development partners). That seems quite simple and the partnership is doing this, but what is complicated is how the opportunity to engage is presented in such a way as to have it feel like an opportunity rather than it being something that the core partners is imposing on these groups. A lot of time is spent thinking about how to talk about this from an opportunity and risk mitigation point of view. The intention is to specify how existing health priorities can make the best use of the existing GPEI assets to help meet their needs. Examples of some of the elements requiring regional- and global-level plans include global and regional polio laboratory networks, central surveillance functions, outbreak response capacity, containment policy and management, and GPEI governance structure. Noting that he did not talk much about containment policy and management, Dr. Vertefuille emphasized that this is a major component of planning. An example of an outcome goal for global and regional plan development pertains to global-level GPEI assets include safeguarding polio eradication, making a defined contribution to strengthening national immunization health systems and global health security, and minimizing risks associated with cessation of current GPEI funding.

In terms of regional and country timelines for transition planning, 14 countries and 5 regional offices will be expected to have transition plans prepared by the end of 2016, and 2 countries and 2 regional offices will be expected to have transition plans prepared within 12 months of interruption in the endemics. The endemic countries, Afghanistan and Pakistan, are planning to start somewhat later because their major focus currently is on disrupting WPV transmission.

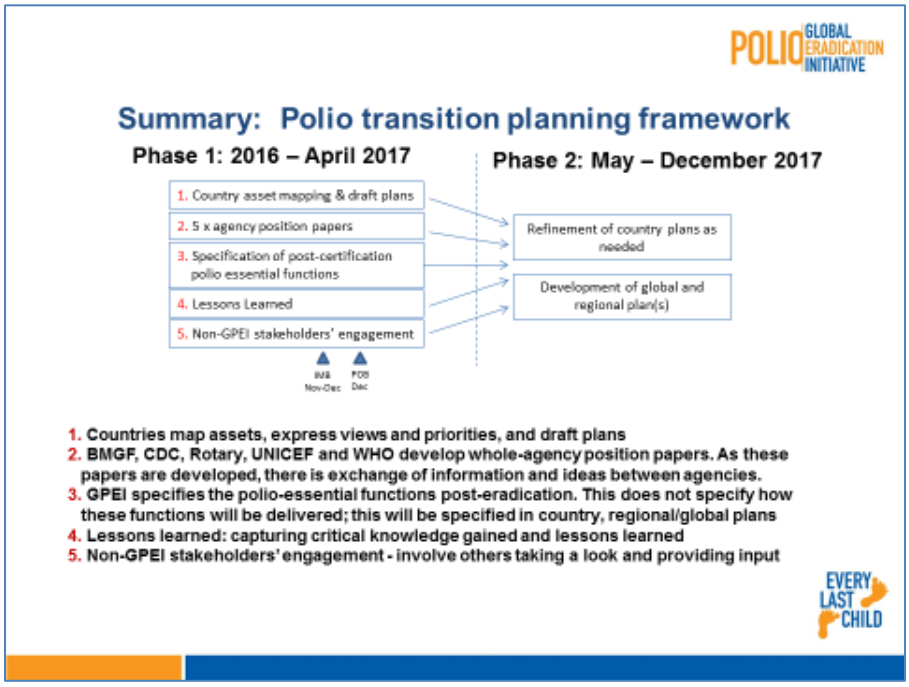
Shifting to agency-specific transition plans, each GPEI agency is already setting up a process to develop its own agency-specific transition plan. The CDC model includes agency-specific asset mapping, governance structure with a Steering Committee to provide oversight and high-level strategic guidance, a cross-agency multidisciplinary Task Force to discuss and agree upon agency priorities / position, and a Secretariat to conduct day-to-day management and coordinate external stakeholder engagement. CDC sits on all of the external committees for GPEI on the bigger transition processes, and the Secretariat interacts regularly with those committees to ensure that CDC maintains alignment with the global goals. CDC already has developed work streams of polio and non-polio staff to develop its agency transition plan, and proposes that other agencies do likewise so that they align with one another. Respective agency work streams should develop a costed, post-2019 base case plan to deliver polio functions alone, and consider and cost other options in which polio functions could be delivered differently and / or integrated with additional objectives. CDC has not yet completed the mapping exercise, but is very close. This exercise is quite complicated because it requires reaching across several financial systems within the agency, with wide staff who are funded by the polio appropriations. Defining and quantifying the softer parts of what CDC does (technical assistance that changes the outcome of a campaign, practical application of vaccine delivery in various access-limited environments, et cetera) in a way that can be discussed is an asset that needs to be managed and protected is highly difficult. The process will be coordinated across agencies through the GPEI Transition Management Group.

Within the agency, some other larger efforts are underway that guide CDC, such as the recently released "2016-2020: CDC's Strategic Framework for Global Immunization." This plan outlines activity areas where CDC can make specific contributions to achieving global immunization goals. It also outlines a wide range of other objectives that focus on improving immunization throughout the world, accelerating delivery of new vaccines where appropriate, guiding science, and other activities. This plays heavily into CDC's polio transition planning process.

With respect to the CDC polio transition planning governance structure, the CDC Polio Legacy Steering Committee provides overall stewardship and guidance; strategic alignment with CDC and global goals; oversight and risk mitigation; and guides planning and implementation of the CDC transition plan, assessing the risks and what risks are included in the planning process. The CDC Polio Legacy Task Force is responsible for ownership of branch-specific tasks and deliverables; creation and execution of action items; producing, reviewing, and presenting appropriate project deliverables; and providing status reporting to the CDC Polio Legacy Steering Committee. The CDC Polio Legacy Secretariat is responsible for day-to-day project planning and delivery; strategy development; external stakeholder engagement; and status reporting to the CDC Polio Legacy Steering Committee.

Regarding progress, the Africa work plan has been submitted. This was a monumental task. Consultants have been recruited and trained on what the work plan should entail. Asset mapping has been completed in 7 priority countries in Africa, and funding for consultant deployment is being finalized. The Asia work plan is in progress. The technical assistance plan is being developed for several Asia countries. India has had a couple of technical assistance visits so far. The South-East Asia Regional Office (SEARO) has funds available for consultants. Transition messages are being included in key events.

Concerning challenges, with country-, regional-, global-, and agency-level, it is difficult to move the transition discussion ahead in light of competing priorities. CDC decided they could not wait, so the agency pursued a lot of this before guidance existed. This has allowed CDC the opportunity to influence the global guidance. There are inconsistent levels of awareness at the country-level, and it is not clear that MoH officials have been briefed on the GPEI budget ramp down. Engaging non-polio stakeholders at the country-level is one of the most important aspects of this work. Getting it right is going to be looked back on as either a major success or major failure. The truth is that getting there is going to require a lot of honest looking. The process is still very polio-centric. At CDC, the planning process was riddled with three steps forward and two steps back. They would pursue something and think they were engaging the right partners within the agency, only to discover that they had forgotten an important partner, which would require redesigning and re-outfitting to include them. The countries have begun the process, but the guidance and mechanisms through which they generate evidence is not fully clear. The following graphic lays out the timeline for the polio transition planning framework:



Agency transition plans are well underway and position papers exist in various forms, although they have not been shared externally by any of the agencies yet. Some are probably further along than others. Post-certification of essential functions post-eradication has just been taken up by the GPEI Strategy Committee, which is the senior most management group within GPEI. They have set a timeline to have that plan developed within 7 to 8 months, which will define how to maintain polio eradication, how to deal with containment, what the essential functions are, et cetera.

Determining the lessons learned and application of those lessons are being pursued in various forms. There are numerous history projects on what the eradication effort was, documenting that, and defining it. This ranges from collecting verbal histories from people who have been involved in different roles in the program globally and at country levels, to collecting artifacts and documents associated with the partnerships that are important to preserve. There also are most technical components such as journal articles and supplements associated with what has transpired with polio, and what was delivered. A supplement is currently being developed on this, and the documents are beginning to go through the clearance process. Perhaps by March 2017, these will be published. Collaborations with schools of public health, management, and government are planned as well.

The Boston Consulting Group (BCG) and McKinsey studies provided outputs such as the pie chart shown earlier. The sensitisation and transition planning processes are fairly pervasive around the partnership, which Dr. Vertefuille said he articulated with a clear recognition that this was not the case 12 months ago. There has been a concerted effort by the partnership to put this on the "front burner." The transition guidelines have been developed and disseminated as mentioned earlier. The GPEI budget ramp down for 2016-2019 was planned and published. Because of the outbreak in Nigeria, that will be reviewed in March and some assessments will have to be made about what the medium-term ramp down will look like and where it will continue. It will continue in that part of the African continent, but in other places that are more central to that outbreak probably will defer that ramp down. Country processes are accelerating.

Revisiting the challenges, there are limitations of the GPEI's role and credibility. There is a need for an "honest broker" across this that allows for and encourages the discussions with non-polio partners who need to be involved in this process. Information gaps are everywhere. As much information as there is about this program, there are assets that are harder to define in numbers. There are many information gaps related to that which have to be sorted out in order for this planning process to delivery what is anticipated. Financing has been and probably will continue to be a challenge and will have to be monitored and maintained.

Discussion Points

Dr. Farley asked in an ideal world and a perfect transition, what staff in a rural area who are currently engaged in surveillance and vaccination response would be doing in five years and where their funding will come from.

Dr. Vertefuille replied that they have this example in several places. In Nigeria where the largest bilateral investment in polio is. A large part of the investment supports 200 plus local government placements that focus on delivering polio services and other routine immunization services. These people are placed within the immunization team in a local government area, and they go through a 1-year set of 9 training modules that focus on different aspects of immunization, such as strengthening the cold chain. It is not just them. This is done with the relevant people from the immunization team. The last order of business is an assignment that, if they do it, actually will help them improve their cold chain. The first order of business at the next training is to review whether they did their assignment, what they found, make recommendations around that, and then move into the next training module, which is a 6-point vaccination session. The point is that as they go through the entire training capacity, the whole team will have gotten better at the work. That is the model. In terms of transition planning with them is that CDC has started to shift their focus more. Early on, it was heavily focused on enumerating populations for better delivery of polio vaccine, finding mobile populations, and expanding outreach services of immunization systems. More recently, they are engaged to determine whether they can better monitor delivery of malaria services. Within GID, measles has been added because there is a measles outbreak in Northern Nigeria currently and measles outbreaks are always occurring there. The staff are focused on better case finding and delivery of routine vaccines with a focus on measles for the coming year.

Dr. Dowdle said it really felt good to see how this program has matured and evolved over time. There were many questions in the beginning, and it was very difficult to understand exactly what they were talking about regarding funding. This is a major step forward, despite the issues that remained to be resolved and questions that remained to be asked. Nevertheless, a great deal of progress has been made and he congratulated the group for all of the hard work put into this. He emphasized that they must not forget that "polio ain't over until it's over," and even then it is not over for a few years later. He stressed that the next 3 to 5 years would be very critical. He did not see in the presentation that they were getting ahead at all, but he imagined that they were extremely sensitive to trying to keep the balance between what needs to be done afterward and completing the job first. He recognized that the balance is very delicate.

Dr. Vertefuille agreed that Dr. Dowdle's statement about balance said it all. In addition, they must build around that capacity to think about the post-eradication so that they are ready when it happens. That really is how they are approaching this. That is why Pakistan and Afghanistan are somewhat further down in the timeline for when this will be the focus with them. Nigeria had been over a year and a half without polio by the time they started

this process. To their credit, when the outbreak in Borno occurred, they shifted their transition processes, but did not dismiss them outright. They had to move their mapping exercise to focus on dealing with the outbreak response, and they have now returned to their mapping exercise. The response is not over. It is going to be a long outbreak response, but this definitely gets to Dr. Dowdle's point about careful balancing.

Dr. Marquez said it was clear to see that there is "light at the end of the tunnel" though they are not quite there because they were surprised by the Nigeria experience. More thinking does need to go into pushing for the endgame while at the same time thinking about the layers of the transition that need to take place.. The conditions in those two countries are similar perhaps to the ones being experienced in Nigeria. He wondered what lessons could be summarized in order to help inform the strategies for the endgame in Afghanistan and Pakistan. In terms of engaging non-polio actors, he wondered how to sell the success of polio and create stories in order to make the case that this generated a multiplier of benefits of fighting polio spreading across the entire health system. He asked what they are doing to document the innovations and population benefits.

With regard to Nigeria and how to apply what was learned from that, Dr. Vertefuille replied that he recently presented at the Rotary District Governor's Meeting in Cincinnati and this was the central theme of the discussion. Those are private donors who are giving to polio and they wondered what Nigeria means, whether this can be done, and what the lessons learned are. There are several global lessons, and they are scrubbing global information whether it is hard quantitative data, surveillance data, and administration data based on Nigeria. He said he could give a whole hour on this, but that he would flag a few. The first is on the critical nature of surveillance. Within the context of the critical nature of surveillance is the crystal clear understanding of what the risks are and where the blind spots are. They knew in Nigeria that they had not seen a case from anywhere in the country for quite a while. They still were getting surveillance data from Borno, and they understood that there was some risk there but probably underestimated that risk to some extent. They must be crystal clear about that fact that if there is a blind spot, it is important to acknowledge it and be conservative when thinking about what that means to the program. If anything, err toward acknowledging that it is something that might be somewhat bigger than if you do not know. Dr. Vertefuille said he said this the way he did was because his first question after he got out of thinking about what the implications were in Nigeria, Cameroon, and Niger and Chad in particular was, "What are the implications for Afghanistan?" In Nigeria, there was one state that they could not access for several years. Afghanistan as a country is not in the government's control. In each situation, they were relying on a less direct administration of services and they were forgiving measurements, meaning that they would say, "If you have a choice between doing nothing or vaccinating without monitoring, get the vaccine into these populations." There is evidence in such a situation that the quality and delivery of the vaccination is not as good as when it is measured in terms of pre-campaign planning, inter-campaign monitoring, and post-delivery measurement. It is important to acknowledge the blind spots for what they are. Also important is to think critically about how, when access can be gained, how to work with a separate intermediary monitoring organization. There are also risk tolerances, such as those pertaining to vaccine supply. Nobody would have thought that hard decisions would have to be made about where to place bivalent polio vaccine in 2015 and 2017 before the Nigeria event happened. There were over 100 million doses of vaccine, so they had to readjust calendars on a global level to accommodate that. It will impact their thoughts about what the size of the vaccine stockpile needs to be now, in the immediate post-eradication period, and what the plan and processes are beyond that for how outbreak responses are approached. Access is linked to quality. There is a gradient: inaccessible, accessible with a lot of caveats, and totally accessible. When

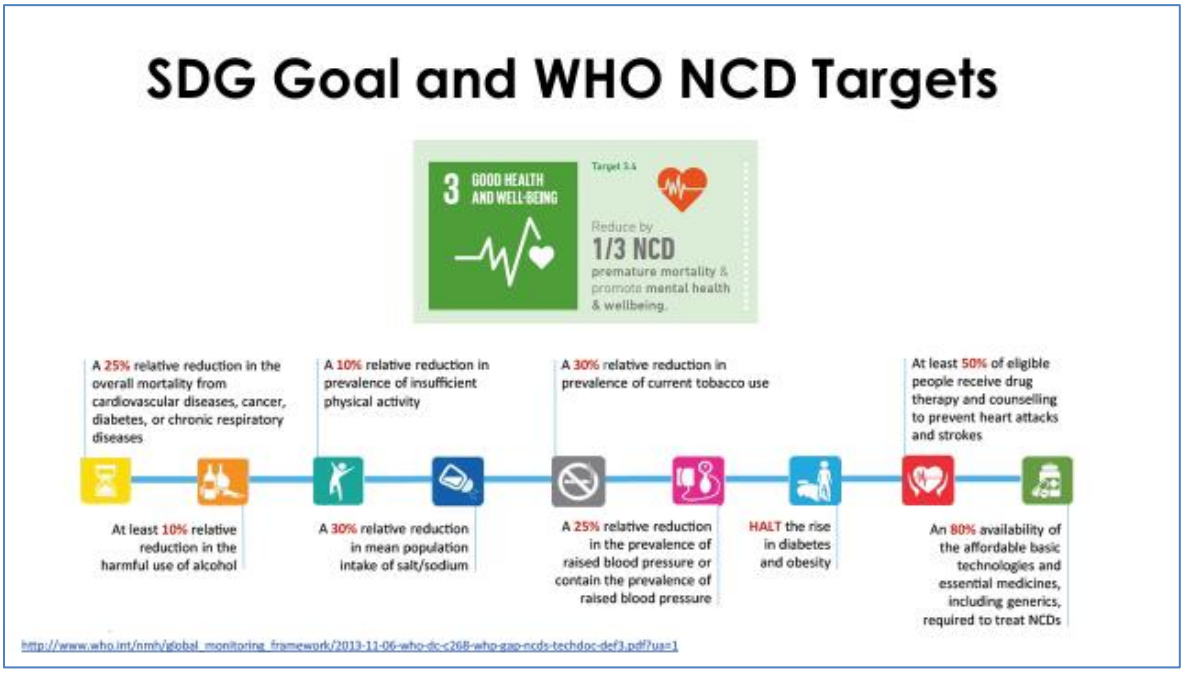
vaccinators were killed in Kano in 2013, it took about 14 months to get the quality improvement there that had been seen in other places. There is somewhat of a "hangover" with lack of access followed by gaining access, so consideration must be given to accelerating the quality improvement that comes with delivery of services. In terms of making the case to other partners, the plan that the Strategy Committee is now developing with regard to the post-eradication period is a central way to go about doing that. It seems like a short timeline at this point. If all went well, they would interrupt the virus in 2018 and declare eradication in 2019. He did not dwell on that graphic, but the tailed down budget during the year of eradication is still about $164 million of staff who are funded by the program around the world. The development of the post-eradication plan, particularly if it lays out opportunities for better delivery of polio vaccine as a way to maintain a polio-free world, and particularly if it lays out opportunities for integrating surveillance or expanding the laboratory network, and makes an investment in those as part of the immediate post-eradication period, then donors would come in as co-investors rather than taking over. One of the chief complaints over the years about the polio program is that it is so vertical, it detracts from routine immunization. Particularly in the 16 countries where there are big investments, a case must be made that routine immunization would be worse off without polio and its staff and that there are ways to capitalize on the gains made. Nigeria, Afghanistan, and Pakistan have some of the worst immunization rates in the world. There is a reason that they are last in polio, which is that the structure has not existed.

Relative to Nigeria, Dr. Farley asked in retrospect from a surveillance standpoint whether there were any lessons learned that should be collected.

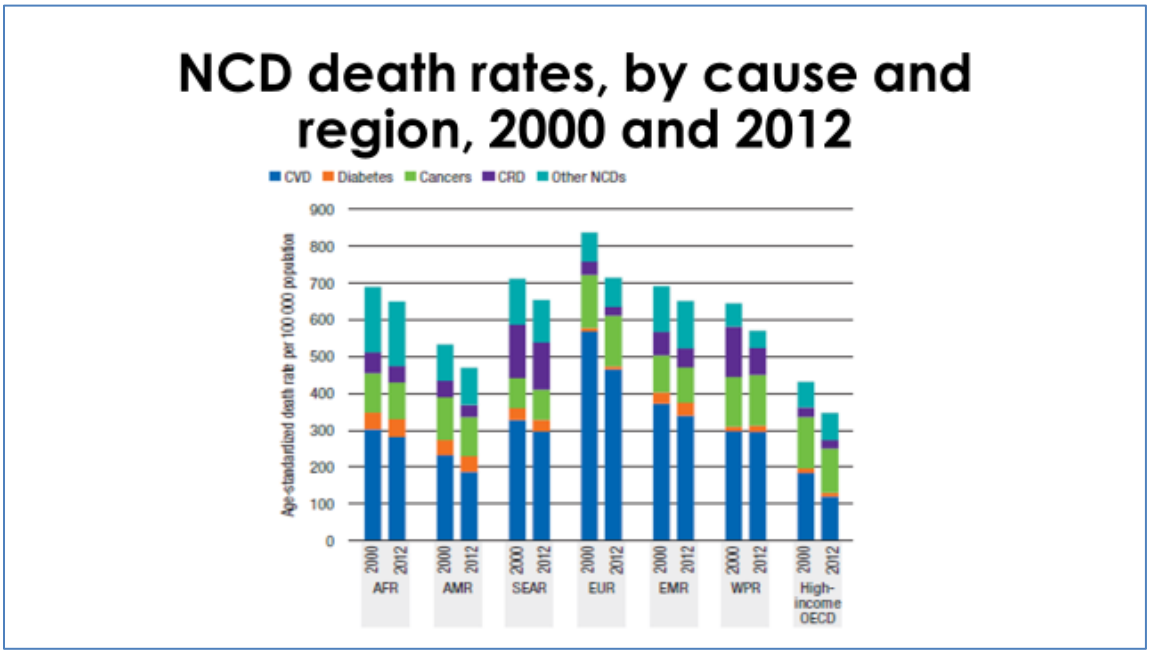
Dr. Vertefuille responded that they already are taking the application of that to any other place they think there is a blind spot. The application of changes associated with that will become apparent in Afghanistan and what they are doing. They have ways that they use community informants in Afghanistan in communities that they cannot get to. Consideration is being given to if / how that is a best practice and if there are applications for that in other places. In Madagascar, there is an ongoing outbreak, although a case has not been seen in a while. However, the surveillance has not been improved in a considerable enough way to close the outbreak. Several countries in Africa are named as having weak parts in their surveillance systems. CDC put in a request for additional staff in February, and it was approved. Many of those staff are surveillance officers, because they feel that shoring up any remaining gaps is essential in terms of approaching eradication. At the partnership level, he sits on the Eradication Management and Outbreak Group. A Surveillance Task Team was established in that group last month to assess all of these issues to determine how to create a high-risk list for surveillance, and what would be applied to that.

Global Hearts Initiative

Samira Asma, DDS, MPH (Chief, Global Noncommunicable Diseases Branch, Division of Global Health Protection, Center for Global Health, Centers for Disease Control and Prevention) presented information regarding the Global Hearts Initiative. The Global Hearts Initiative is a strategic approach to improve cardiovascular health on a global scale through collaboration between the WHO, the CDC, and partners. The Sustainable Development Goals (SDG) and WHO Non-Communicable Diseases (NCD) targets are depicted in the following graphic:



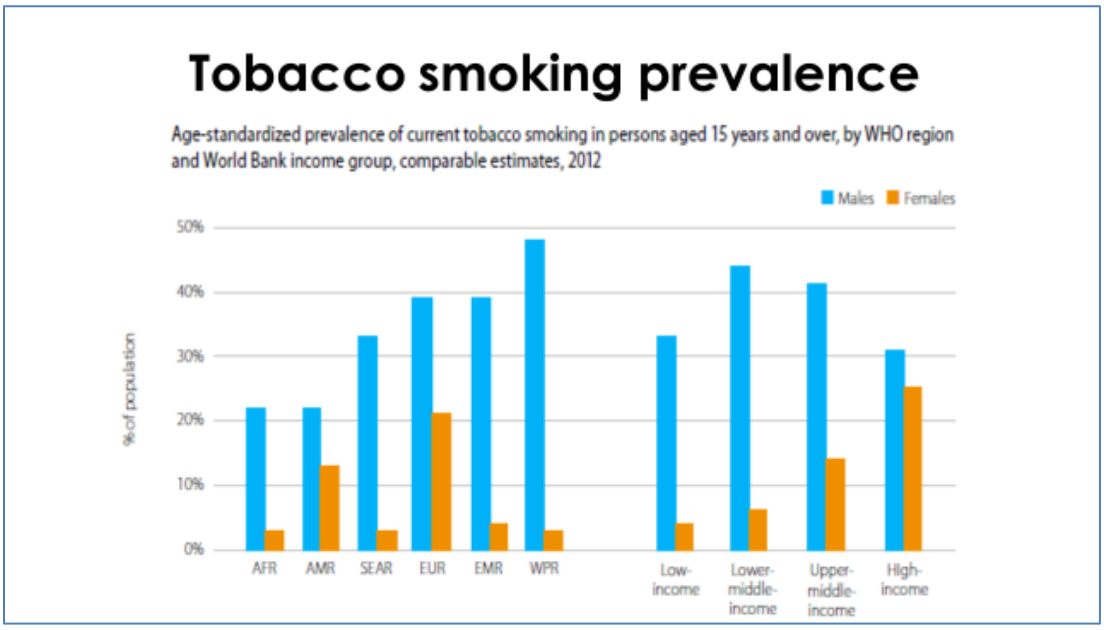
Action on NCDs and cardiovascular disease (CVD) is supported by SDG 3.4, to reduce by one-third NCD premature mortality. The WHO NCD Global Monitoring Framework (GMF) sets a voluntary target of a 25% reduction in premature CVD deaths by 2025. These are very good goals for which to aim. NCDs is the leading cause of premature death for those under 70 years of age at 52% (16 million). CVD mortality takes the largest share of the NCD burden at 37%, followed by cancer at 27% because of the risk factors. The following graph looks across the WHO regions as well as the high-income groups:



There is good news in the high-income countries in that decreases have been observed; however, the numbers are still quite high. Heart disease and stroke will continue to kill the most people worldwide. The proportion of people worldwide who die from heart disease and stroke will continue to increase over the next two decades unless urgent action is taken [WHO, World Health Statistics, 2008].

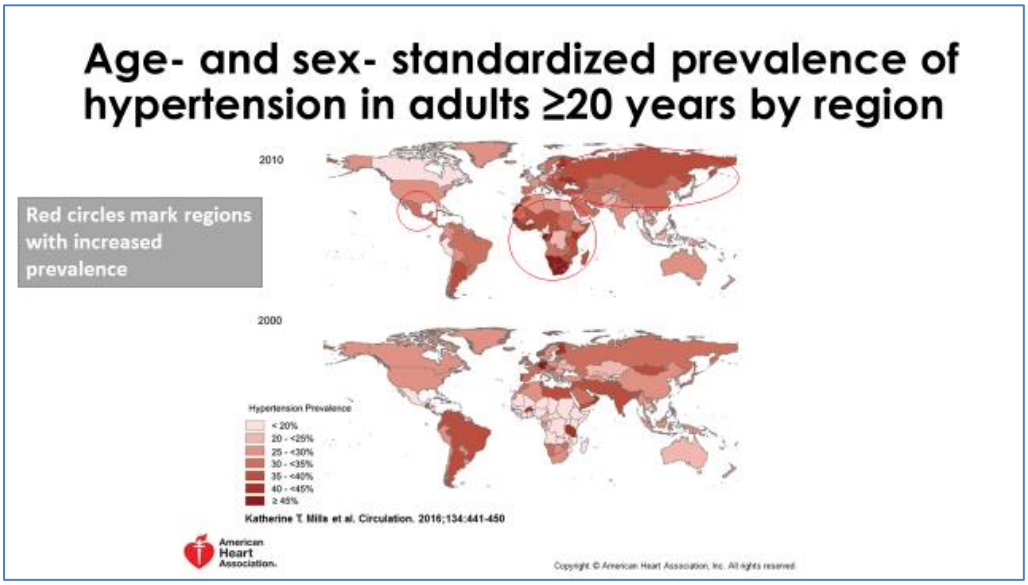
Of the deaths from heart attacks and strokes, 80% occur in low- and middle-income countries (LMICs). In these settings, many people are not aware that they are at risk for CVD and poor health outcomes are increasing. The differences in survival between high-income and other countries is often due to lack of accessible and affordable health care. CVDs are too expensive to ignore, particularly in LMICs. CVDs account for an economic burden of $3.76 trillion, and health costs for heart disease make up nearly 20% of total health expenses in LMICs. The major modifiable causes of vascular mortality are very apparent and include: tobacco, blood pressure, blood lipids, and adiposity [Sir Richard Peto, et al, Oxford University].

In terms of tobacco smoking prevalence, the World Bank work in the Philippines is a remarkable story. However, this shows smoking prevalence across WHO Regions and by World Bank income group:



A lot of work is being done through the Global Hearts Initiative by the Work Bank, the Gates Foundation, and Bloomberg Philanthropies, and countries. However, much remains to be done.

Sodium intake represents another risk factor for CVD. CDC has been engaged with China on a large-scale project known as the Shandong Ministry of Health Action on Salt Reduction and Hypertension (SMASH), and hopes to have results after four years. Results thus far are showing promise for blood pressure control rates, as well as adaptation of using a low sodium diet across the food chain. Obesity has a trajectory that is growing in many of the regions, particularly in the Mediterranean. High blood pressure is the leading risk factor for heart attacks and strokes. The following maps show data from 2000 and 2010 for the age- and sex- standardized prevalence of hypertension in adults 20 years of age and older by region:



The 2010 maps shows more pockets where high blood pressure is becoming more prevalent, especially in Mexico, Asia, Europe, and Africa. The African Subcontinent shows the highest prevalence of high blood pressure. Most of the greater than 1 billion adults with hypertension worldwide do not have it under control. Just 1 in 7 adults with hypertension have it under control.

It is known that hypertension is easy to treat and manage through low-cost high-impact interventions. For example, a multi-drug package targeting CVD in 23 LMICs has been estimated to reduce annual CVD death rates by 1.5% at an average cost of $1.08 per person. With a large proportion of the population in LMICs suffering from elevated blood pressure, hypertension management for even half of moderate- to high-risk patients in LMICs can avert an estimated 0.77 million deaths, or 15.4 million Disability-Adjusted Life Years (DALYs) at a ratio of $23 in benefits per $1 spent [Sources: World Health Organization. Scaling up action against NCDs: How much will it cost? 2011; Nugent R. Benefits and Costs of the Non-Communicable Disease Targets for the Post-2015 Development Agenda. 2015].

This was a good business case to focus on addressing CVD in a concerted way. With that in mind, over the course of 9 months, the Global Hearts Initiative was developed to reduce CVD. It was launched successfully in September 2016 on the sidelines of the General Assembly of the United Nations (UN). The event was hosted by the Consulate on Foreign Relations. There were many dignitaries present, including two Ministers from Barbados and a representative from the Philippines. Global Hearts is a multi-partner initiative of national governments, WHO, CDC, and professional organizations such as the International Society of Hypertension (ISH), World Heart Federation (WHF) and others and are looking for additional partners with the HIV/AIDS perspective. The initiative answers the *Lancet's* call for a technical package to tackle this issue. The initiative takes a three-pronged approach to preventing cardiovascular diseases and implementing population-based strategies by uniting three technical packages:

- MPOWER, which focuses on tobacco cessation interventions
- SHAKE, a new initiative rolling out this year that will support governments with evidence-based policy options and examples to help lower sodium consumption
- HEARTS, also rolling out this year, which will provide primary care health systems with best practices and tools to improve clinical preventive care for cardiovascular disease

Combined, these technical packages provide a set of high-impact, evidence-based interventions that, when used together, will have a major impact on improving global heart health. As Dr. Frieden has reminded everyone, that perhaps a concerted effort in the management and clinical side presumably would not be very expensive and also would soften the policy in the countries. While that has yet to be seen, CDC is in the process of developing the implementation toolkits that countries could use. The tools are to be developed by the end of December 2016, and will be taken from successful models such as Million Hearts®. Million Hearts® has been very successful in the US. California and Minnesota already have shown some significant increases in control rates for high blood pressure and other CVD declines, using policy and the clinical paradigm. The HEARTS Technical Package will give countries the tools they need to incorporate CVD management best practices at the primary health care level to reduce CVD illness and death. Implementation of the package will prevent heart attacks and strokes through improving equitable access to ongoing, standardized, quality care. This package is modeled on successful implementation tools from global TB and HIV programs that show that rapid improvements in treatment and management are possible.

CDC also collaborated with *The Lancet* and many experts to release *A Lancet Commission on Hypertension* in September 2016, 10 recommendations to address the global burden of raised blood pressure on current and future generations. As mentioned earlier, hypertension is the leading risk factor for CVD and very expensive and deadly on its own. *A Lancet Commission on Hypertension* called for 10 key actions pertaining to prevention and treatment, as well as a technical package to treat hypertension:

Prevention

- Improved public understanding of unhealthy and healthy lifestyles, as well as elevated BP and its consequences
- Policy and environmental strategies to promote health and support healthy behaviors
- Improved access to effective health care delivery systems

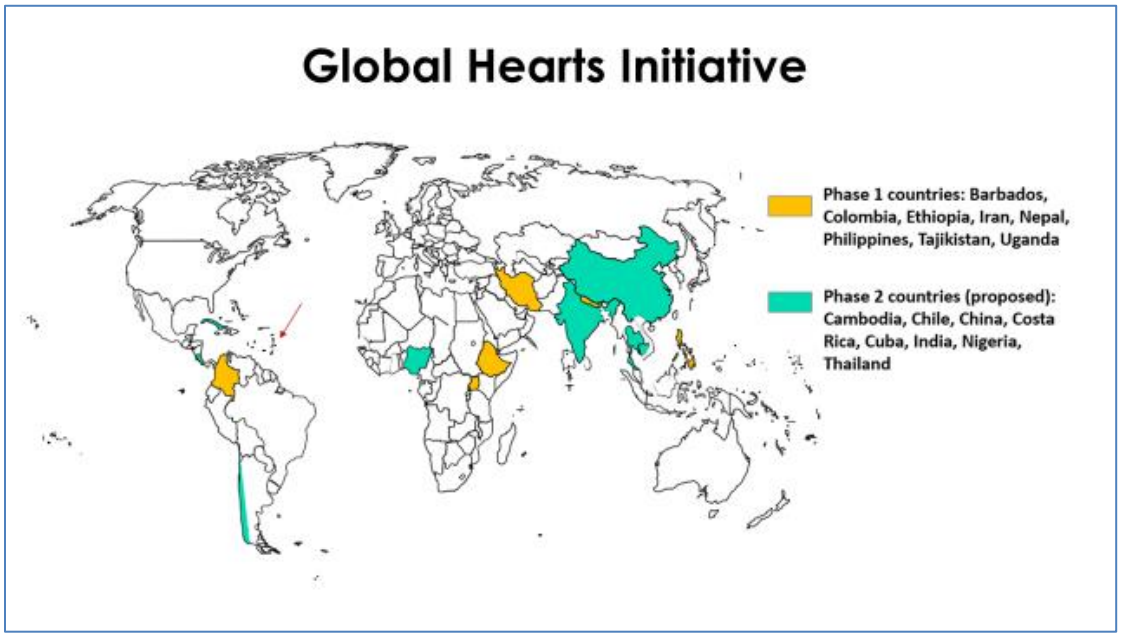
Treatment

- Standard protocols for investigation, treatment, and monitoring
- Team-based care, task sharing and workforce development
- Access to affordable medications, technology, and health care
- Surveillance, patient registries, and information systems

On October 18, 2018, *The Lancet* invested in a demonstration project of a national scale in India. This is another element from which to derive experience.

Dr. Asma briefly described two standard hypertension treatment pilot projects in which CDC has been involved. In Barbados, over 30,000 persons were screened at two polyclinics. Hypertension prevalence was determined to be 31%. From June 2014 to December 2015, blood pressure control rates improved by 14%. A significant reduction in mean systolic blood pressure was noted. A cost-benefit analysis is underway, which could support scaling up the intervention. In Malawi, hypertension management was integrated at two PEPFAR-funded HIV clinics. Of the eligible HIV-infected persons, 98% were screened. Hypertension prevalence was determined to be 24% in one clinic and 17% in the other. A preliminary 12-month evaluation of the data shows 31% in one clinic and 25% in the other in blood pressure control rates. Sustained adherence to antiretroviral therapy was noted at both clinics. There are plans to conduct a cost-benefit analyses here as well. These models can be used and replicated in other countries. Cambodia is very eager to implement some of these lessons. A combination of policies and clinical approaches has shown a consistent decline over time in the US. Hopefully, that would not

be difficult to expand into other countries. The Global Hearts Initiative has formal commitments from the countries listed on the following map:



Many additional countries have expressed interest in participating. The partners currently are working on the development of an implementation plan for the initial set of countries. She requested input from the GWG membership with regard to how CDC can improve and expand the partnership, and advice about further shaping the initiative.

Discussion Points

Dr. Farley noted that the prevalence of high blood pressure in Africa was remarkable, and wondered whether it was due to dietary changes.

Dr. Asma replied that while they do not have a direct answer, it could be genetics. There has been a link between HIV and CVD. Diet and high salt content also could play a role.

Also noted was that increasingly, some of the countries have an increasing middle class that might be part of the reason.

Dr. Asma added that the availability of global commercialized products also may be contributing, but pointed out that they are observing this in rural settings in Africa as well as the Caribbean. Some early results from a pilot in Malawi show a similar experience. Given the African Subcontinent and the transitions that are taking place, a serious approach must be taken.

In response to an inquiry regarding whether there also are changes in detection and / or care for chronic diseases in Africa, Dr. Asma replied that this story can be translated to any of the WHO Regions or countries where there is high prevalence of high blood pressure and only half know they have it. Even less than that have it under control.

Dr. Marquez said he had some data from Sub-Saharan Africa that he could share with the group. The observation was made that they could not compromise between infectious and NCDs. On the basis of that observation, the goal is within countries that have resource limitations to determine how to use other platforms to address universal conditions. That is, how do you build upon the infrastructure created by the communicable disease programs to screen and implement interventions?

Dr. Farley asked whether the Global Hearts Initiative has funding behind it by philanthropists or the US government, and whether the commitments from countries includes commitments of funding as well.

Dr. Asma responded that the early funding has been from CDC, because they have convened partners and brought it to this stage. MPOWER has been jointly supporting several countries through the Gates Foundation and Bloomberg Philanthropies. The other two do not have any extended funding at the moment, but the WHO and partners are seeking funding. CDC has put forward a proposal for $10 million to the CDC Foundation, and has also been in consultation with others to explore ideas and opportunities. Countries like the Philippines and Thailand have said that they need only technical tools and technical assistance, but would not need funding given the structured way of delivering care. These countries have not made CVD a priority at this point. USAID is another potential partner CDC could engage in this initiative. While there is no funding at the moment, CDC is exploring the many potential opportunities.

Dr. Marquez pointed out that they should view actions within this initiative as potential forces for financing the full initiative. Modeling on alcohol tax has been done to inform decision-making by the MoHs. In the case of the Philippines, over a 3-year period after the adoption of a sin tax reform, $3.6 billion was mobilized. Of that, 80% was used to finance the enrollment of the low-income population into clinical care through the national health insurance program. As part of that enrollment, people received services and medication. That shows that some the clinical interventions could be financed. Another win-win for health and win-win from a systems perspective is soda tax. Sodas are driving the epidemics of obesity and diabetes. Publications are beginning to come out that are very positive in terms of reduction in consumption and resources that are mobilized. He emphasized the need to think “outside the box” to establish win-wins for these types of initiatives.

Dr. Elias said he thought one opportunity for long-term financing might be to link this to the growing momentum around universal health coverage, and particularly to tie hypertension as a sentinel indicator of the performance of a primary healthcare system. Many of these interventions are policy interventions that occur outside the health sector. But within the health sector, over the last 15 years there has been a growth in competition among the vertical programs such that it is difficult to see one succeed except at the expense of another. If they try to make the five major NCDs another set of competitors in those vertical silos, it is a lose-lose discussion; whereas, if they could think about how to move from the vertical programs to a more comprehensive universal health coverage, which has at its base a strong primary healthcare system, it would be beneficial. This aligns very well with the SDG vision. There are certain sentinel conditions that a primary healthcare system should be able to do, such as immunizing children, find and treat hypertension according to an effective evidence-based protocol, et cetera. Countries such as the Philippines and Thailand have said that they do not need funding. The World Bank now has its annual meeting of financing of universal healthcare coverage, and the projections are that most of the resources will come from domestic sources whether they are allocated decisions in national budgets, subsidized by sin taxes, et cetera. The future is about how to switch to a system approach in which the

system serves the unfinished agenda in communicable diseases, reproduction, maternal, mortality and the rising mortality of heart disease and other non-communicable diseases. The SDG 3 vision provides the facilitation to do that.

Dr. Asma said that she liked the idea about the sentinel indicator of the performance of a primary healthcare system.

It was noted that probably one of the most important things for getting some traction on chronic disease prevention in this country was the small amount of money that CDC allocated to states and localities to create some core analytic and policy capacities so that information that was being collected was being used effectively to promote the creation of health systems and policy interventions. Thought should be given to how to make that occur globally. MoHs are having the same problem that the US has experienced in getting visibility on the issues. The GHSA is designed to help detect and respond to emerging outbreaks.

Dr. Marquez emphasized the importance of not forgetting the driving argument for an integrated approach, beginning with primary healthcare. The Affordable Care Act (ACA) will be remembered as one of Obama's legacies. From his perspective, one issue that is going to have the most impact is the increase in taxes on cigarettes that was used to expand the coverage of the Children's Health Insurance Program (CHIP) for low-income children. Tremendous gains have been made through such revenues to improve health conditions and life expectancy. These stories need to be told again to make the argument that there are other ways to help mobilize resources. All of the countries in the world that have subscribed to the development action agenda are committed to mobilize taxes of at least 15% of gross domestic product (GDP). The questions are, "What do you do with that money? What are your priorities for development?" It is important to strengthen the case in order to justify the allocation of resources for this particular priority.

Dr. Asma shared an experience from Ethiopia. The lead representative who launched a national CVD initiative in Ethiopia presented at one of the meetings with Dr. Frieden. This again acknowledged the challenges of non-communicable disease, and balancing the management of cancer treatment and CVD. While they have a plan, they are starving for medications. To make a change, they at least should get high blood pressure under control but medications are not accessible. It was very eye-opening to hear the story from Ethiopia.

Dr. Farley stressed that there is a risk in having this important agenda folded into a universal healthcare approach. Even with a lot of healthcare in this country, hypertension management is terrible. Healthcare does not guarantee quality. Hypertension management as a sentinel indicator of the performance of a primary healthcare system could easily get lost. There is always a demand for healthcare, but there is never a demand for public health. His suggestion was let the people who are going to manage healthcare manage that, but not to put scarce public health resources into that.

Dr. Elias clarified that he was talking more about how to harness resources. He would not fold it into universal healthcare. Taking advantage of the momentum and the resources that should be going with that following the commitments made, would allow for focusing specific efforts. Much of this agenda, particularly on prevention, is outside of the health sector. This is about food systems, surveillance, et cetera. The thing about public health is that it does not get captured in primary healthcare or universal health coverage. Some of these things are not going to happen without specific agendas around salt, tobacco, et cetera that require very specific analyses and policy interventions that are not purely health sector interventions.

Regarding a question about mass screening for hypertension, it was noted that hypertension treatment is extremely inexpensive.

Dr. Asma indicated that the CDC Foundation is exploring the potential for funding from private interest groups that make blood pressure machines.

Dr. Marquez emphasized that primary prevention is an integral part of universal health coverage, because the ultimate outcome has to be healthy populations. Primary prevention can generate tangible results.

Dr. Farley asked if there was consensus that if CDC provides technical assistance and tools, countries could implement some of these primary healthcare initiatives.

Dr. Farley agreed that the tobacco initiative is a good model for showing what a small amount of money can do when there are taxes available through that initiative.

Dr. Marquez noted that in 1964, a Surgeon General report on tobacco and health changed the discourse across the world, not only in the US. That was 50 years ago. That kind of global public good should be the model for moving this forward.

Ms. Dougherty indicated that she recently was in Thailand and commented that the relationship with US CDC and Thailand Ministry of Public Health is based on technical assistance. In recent years, Thailand has requested additional assistance on how to drive that technical assistance to decision-making and policy. The US tends to take it for granted that this is a natural progression in public health, but this is a niche that is not quite filled in a lot of countries in which CDC works. Thought should be given to how to further the evidence, further good public health policy, and take action. There are examples where this was done effectively. CDC is thinking more creatively how to work with other USG colleagues to determine how to bridge this gap.

Dr. Kapil asked whether that was somewhat a reflection of a lack of understanding of what public health actually is. It seems like in a lot of countries, public health has been an afterthought and an outgrowth from clinical medicine and clinical care. He wonders if there is a fundamental lack of what public health represents, and how the US uses public health and public health data to drive public health policy.

Ms. Dougherty said that from her observation, there is no better place than Thailand for public health. Like US, medical care is in one part of the government and is also decentralized. The Public Health Ministry deals with surveillance and evidence; and needs to reach across government to impact changes in policy etc. It is

important to harmonize that work with colleagues across the US government and other partners, including USAID and the Embassy, to try to figure out how to influence these policy changes across host countries.

Dr. Farley said this reminded him of Philadelphia with its healthcare system, health department, and the city council. He pointed out that progress has been made with policy initiatives when there is a sequential step through data collection, data analyses, advocacy, policy development, and policy initiation. Perhaps there is a way to codify that technical package and that sequence to provide training elsewhere to have a universal template.

With regard to making the Global Hearts Initiative more of a priority, given the launch in September that was high profile, Dr. Asma asked for advice to keep the momentum going at the global or even regional stage in some regions. From the tobacco experience, there were round tables and the core process generated a lot of discourse. She requested input regarding how to keep this "on the radar" while funding is being sought.

It was noted that having champions always helps, particularly high profile champions. For example, getting Michael Bloomberg as an Ambassador is to be congratulated. Perhaps an effort should be made to get this agenda on the agenda of the new leadership at WHO and the UN.

Dr. Elias suggested finding allies in other sectors. Many other issues are driving obesity, such as food systems, the shift to urbanization, and high sugar and salt content in processed food even in very poor countries. There is an important discussion with the agriculture sector. He has found that African Ministers often are much more interested in the agriculture sector, because it is the primary source of the economy in most Sub-Saharan African countries. Therefore, it often gets more attention from Heads of State and Finance Minsters than health does. There also should be conversations with nutrition advocates. Most African countries are in the process of a fundamental transformation of their agricultural systems, such that they are moving from small subsistence farming to trying to connect their agricultural systems to the global economy. There are healthy and unhealthy ways to do that. There is a broader set of government policy issues, which often are of greater salience to the Heads of State of the countries because it is tied to their economy more visibly than health is. Health is probably as tied, but they do not see it as readily as they do in the agricultural sector. Some natural synergy could be found in some of the discussions pertaining to healthy food systems, reducing post-harvest losses, and other things that could help in the efforts to reduce sodium and sugar intake in processed foods. It is a broader policy conversation with the government that goes well beyond the health sector. It is about how they are industrializing, managing urbanization, and connecting value chains from farm to supermarkets. The rise in supermarkets in African cities is potentially a good thing if it improves the value chain for healthy food, but it also could be a vehicle for bringing a lot more sugar and salt to people's diets. That could get a lot of attention from Heads of State because it is tied more to their economic development plans.

Dr. Marquez agreed, emphasizing that they must learn to make the case. For example, in April they organized a global event on mental health. Some of their partners were adamant about stressing mental health only as a health issue. It was necessary to argue from the perspective of the workplace in terms of productivity gains, reducing absentees, and the economic impact of addressing the issue versus non-action. Taking a different perspective can gain traction in the minds of the Ministers of Finance who see numbers and want to know how something impacts their economy in terms of revenues lost or increases in expenditures. This is the type of

argument that must be made to increase the relative importance of health within the budgetary allocations of countries.

Summary / Closing Remarks

Dr. Tom Farley (GWG Chair; Chief Executive Officer, Public Good Projects) emphasized that cutting across the various topics throughout the day, there were several very interesting and worthwhile discussions. He requested input about what the group would like him to take forth to the ACD about global health.

Discussion Points

Dr. Elias noted that one issue during the Zika discussion that they did not delve into deeply was what euphemistically was referred to as the debate over the case definition around the reporting from Puerto Rico.

Ms. Pam Dougherty said she would be happy to follow up.

Dr. Wolfe emphasized that whenever they have the opportunity, they should be making the point that the agency's engagement with middle-income countries is critical, but CDC is not a development agency. It is a technical assistance agency. Zika is a very good example of why CDC needs to have diplomatic and technical collaboration with low-income countries and not forget about them when they become middle-income countries. There often is skepticism and a general feeling among appropriators that the focus should be on middle-income countries. There is a tendency to focus global health assistance in low-income countries. Zika helped highlight the need for technical collaborations with small countries, and the need to maintain that collaboration not just in times of crisis in order to be able to assist in times of crisis. This is a good opportunity for CDC to make this case.

In that regard, Dr. Vertefuille added that in terms of the polio transition, there was a focus on expanding global immunization as part of what would come after polio. A major gap in the current global efforts related to that is that they do tend to focus on the lowest income countries. There is a group of graduated and graduating countries from GAVI that are not captured in the coordinated effort to improve immunization. The immunization world is struggling with this issue and how to assemble a coalition that would be more global in its reach.

Dr. Farley pointed out that there was another conversation the group had during lunch that he wanted to bring forward, which pertained to concerns about the ending of funding for the GHSA and making a formal recommendation to the ACD to be forwarded to the new administration to set a priority to continue funding for the GHSA. With that in mind, he read the following potential recommendation he prepared for the GWG to vote on and take forward to the ACD:

> *The GHSA has been successful in identifying vulnerabilities to global health threats in preparing low- and middle-income countries to respond rapidly to disease outbreaks of global significance; building horizontally the structures necessary to support disease-specific programs such as PEPFAR; and in improving local responses to establish public health security against threats such as Malaria and Yellow*

Fever. However, the funding for this initiative will end in FY19. The ACD recommends that CDC work with the new administration to set a priority for additional funding to continue the GHSA beyond FY19.

Motion / Vote

A motion was made and seconded to adopt the recommendation from the GWG to ACD, with minor wording changes before taking it forward on October 20, 2016. The motion carried unanimously.

Dr. Farley thanked everyone for their attendance and the great discussions. With no additional business raised or questions / comments posed, he officially adjourned the meeting at 3:32 p.m.

Attachment A: Meeting Attendance

ACD MEMBERS

Thomas A. Farley, MD, MPH, (Chair) Chief Executive Officer, Public Good Projects

Christopher J. Elias, MD, MPH, President, Global Development, Bill and Melinda Gates Foundation

David Fleming, MD, Vice President Public Health Impact, PATH

EXTERNAL EXPERTS

Walter Dowdle, PhD, Consulting Director, Task Force for Global Health

Elizabeth Fox, Director, Office of Infectious Diseases, Bureau for Global Health and Deputy Coordinator, for Maternal and Child Survival Program (MCSP), United States Agency for International Development (USAID)

Patricio V. Marquez, Lead Health Specialist; Health, Nutrition, and Population Global Practice; World Bank

Mitchell Wolfe, MD, MPH, CAPT, United States Public Health Service (USPHS), Deputy Assistant Secretary for Global Affairs, Office of Global Affairs, Department of Health and Human Services (HHS)

INTERNATIONAL REPRESENTATIVES

Willis Akhwale, MBCChB, PhD, Country Director, International Training & Education Center for Health (I-TECH)

CDC STAFF / OTHERS

Samira Asma, DDS, MPH, Chief, Global Noncommunicable Diseases Branch, Division of Global Health Protection, Center for Global Health

Coleen A. Boyle, PhD, MSHyg, Director, National Center for Birth Defects and Developmental Disabilities

Nickolas (Nick) DeLuca, PhD, Associate Director for Communications (ADC), Center for Global Health

Pamela Dougherty, MA, Chief of Staff, Center for Global Health

Alison Johnson, MPA, Deputy Director, Management and Operations, Division of Global Health Protection, Center for Global Health

Vikas (Vik) Kapil, DO, MPH, Acting Designated Federal Official, Associate Director for Science / Chief Medical Officer, Center for Global Health

Kevin Karem, PhD, Associate Director for Laboratory Science, Center for Global Health

Yinka Kerr, MSPH, Deputy Branch Chief, Immunization Systems Branch (ISB), Global Immunizations Division (GID), Center for Global Health

Rima Khabbaz, MD, CDC Deputy Director for Infectious Diseases and Director, Office of Infectious Diseases (OID)

Aun Lor, PhD, Senior Advisor, Office of Science, Center for Global Health

Alexandre Macedo de Oliveira, MD, MSc, PhD, Coordinator for Global Zika Activities, Center for Global Health

Mark Pallansch, PhD, Director, Division of Viral Diseases (DVD), National Center for Immunization and Respiratory Diseases (NCIRD)

Monica Parise, MD, Director, Division of Parasitic Diseases and Malaria (DPMD), Center for Global Health

Suzanne Theroux, Acting Deputy Director, Management and Overseas Operations, Center for Global Health

Hank L. Tomlinson, PhD, Country Director, CDC Nigeria (current); Principal Deputy Director, Division of Global HIV & TB (DGHT) (upcoming)

Geoffrey Wallace, Writer/Editor, Cambridge Communications, Training, and Assessments (CCTA)

Attachment B: Acronyms Used in this Document

Acronym	Expansion
ACA	Affordable Care Act
ACD	Advisory Committee to the Director
ADC	Associate Director for Communications
ADP	Associate Director for Policy
BCG	Boston Consulting Group
CDC	Centers for Disease Control and Prevention
CGH	Center for Global Health
CHAMPS	Child Health and Mortality Prevention Surveillance Network
CHIP	Children's Health Insurance Program
CMS	Centers for Medicare and Medicaid Services
COI	Conflict of Interest
CONUS	Continental United States
CVD	Cardiovascular Disease
DALY	Disability-Adjusted Life Year
DFO	Designated Federal Official
DGHP	Division of Global Health Protection
DGHT	Division of Global HIV and TB
DPDM	Division of Parasitic Diseases and Malaria
DNA	Deoxyribonucleic Acid
EOC	Emergency Operations Center
FY	Fiscal Year
GAVI	Global Alliance for Vaccines and Immunization
GBS	Guillain-Barré Syndrome
GDD	Global Disease Detection
GDP	Gross Domestic Product
GHS	Global Health Security
GHSA	Global Health Security Agenda
GID	Global Immunization Division
GMF	Global Monitoring Framework
GPEI	Global Polio Eradication Initiative
GRRT or Global RRT	Global Rapid Response Team
GWG	Global Work Group
IPV	Inactivated Polio Vaccine
ISH	International Society of Hypertension
IVM	Integrated Vector Control Management
JEE	Joint External Evaluation
LARC	Long-Acting Reversible Contraception
LMICs	Low- and Middle-Income Countries
MDR-TB	Multidrug-Resistant Tuberculosis
MITS	Minimally-Invasive Tissue Sampling
MMWR	*Morbidity and Mortality Weekly Report*
MoH	Ministry of Health
MSC	Munich Security Conference

Acronym	Expansion
NCBDDD	National Center on Birth Defects and Developmental Disabilities
NCD	Non-Communicable Disease
NCEZID	National Center for Emerging and Zoonotic Infectious Diseases
NGO	Non-Governmental Organization
NIH	National Institutes of Health
NPHI	National Public Health Institute
N-STOP	National Stop Transmission of Polio (Initiative)
OCS	Office of the Chief of Staff
PAHO	Pan-American Health Organization
PEPFAR	President's Emergency Plan for AIDS Relief
PHIA	Population-Based HIV Impact Assessments
PMI	(United States) President's Malaria Initiative
PRVCU	Puerto Rico Vector Control Unit
SDG	Sustainable Development Goals
SEARO	South-East Asia Regional Office (WHO)
TB	Tuberculosis
TOT	Training-of-Trainers
UN	United Nations
UK	United Kingdom
US	United States (of America)
USAID	United States Agency for International Development
USZPR	US Zika Pregnancy Registry
WHF	World Heart Federation
WHO	World Health Organization
WNV	West Nile Virus
WPV	Wild Poliovirus
YF	Yellow Fever
ZAPSS	Zika Active Pregnancy Surveillance System